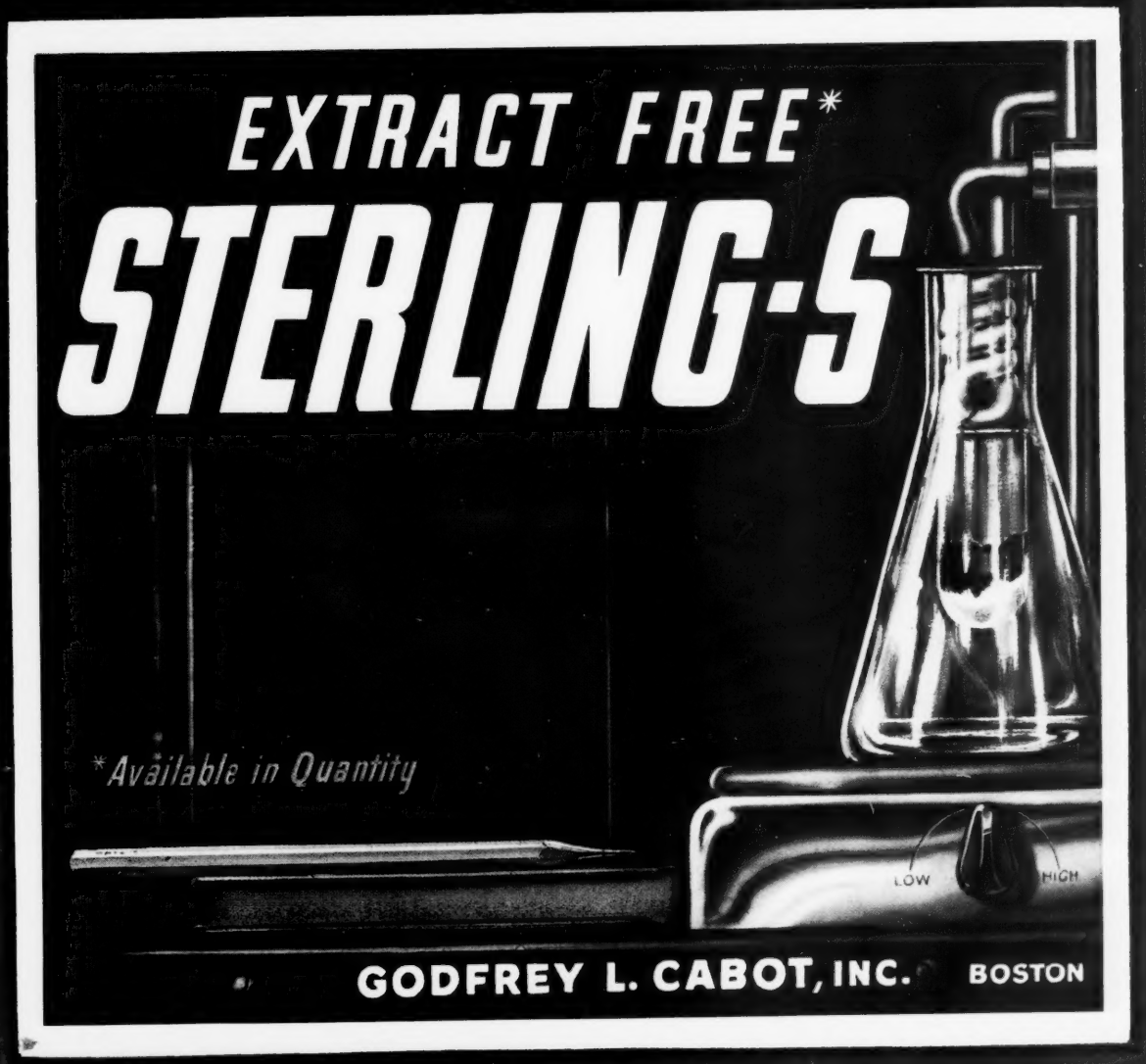
A

WORLD

SYNTHETIC

AUGUST, 1944



Newsletter No. 8
AUGUST, 1944

Published by Rubber Chemicals Division of DU PONT

THIONEX—AN ALL-PURPOSE ACCELERATOR FOR GR-S

THIONEX has proven itself one of the most versatile and economical accelerators for rubber and has attained a position of even greater importance in GR-S. With production of GR-S nearing its peak, there will be an increased demand for an accelerator that will meet the requirements of many different types of compounds.

OUTSTANDING QUALITIES of Thionex acceleration in GR-S are:

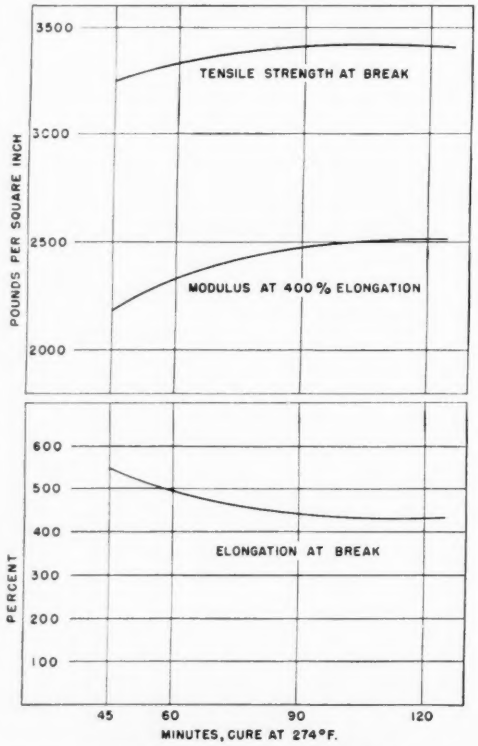
1. Safety in processing.
2. Rapid curing at vulcanizing temperatures.
3. Broad, flat curing range.
4. High tensile strength.
5. Excellent aging and superior heat resistance.
6. Versatility of activation.
7. Acceleration economy.

MOST OUTSTANDING FEATURES of Thionex are its delayed action, or lag, which makes for safety in processing, and its very fast rate of cure at vulcanizing temperatures. GR-S compounds accelerated with Thionex may be exposed to temperatures nearly as high as the curing temperature for a short period of time without setting up, but after this period of lag the cure proceeds rapidly to completion. It is this characteristic of Thionex that is chiefly responsible for its widespread use in a variety of products such as CV wire insulation, drug sundries, mechanical goods, heels and soles, tires, etc.

In addition to curing very rapidly, Thionex accelerated GR-S compounds provide a long curing range with little tendency toward over-cure. This effect is illustrated in the accompanying curves which represent a typical black GR-S compound accelerated with 0.4% Thionex and 2.0% sulfur.

PROPER AMOUNT of Thionex to be used depends on the nature of the compound, type of cure, choice and type of fillers, sulfur content, etc. In some compounds as little as 0.25% Thionex may be used, while in others as much as 4.0% may be used, depending on the characteristics desired in the finished article. Either over or under acceleration will impair the tensile properties of a GR-S compound and for this reason, the proper ratio of Thionex to sulfur should be maintained for best results.

Normally in the neighborhood of 2.0% sulfur is recommended in GR-S compounds accelerated with Thionex, but amounts up to 3.0% or 4.0% may be used to obtain improved dynamic properties. Low sulfur-high Thionex ratios are recommended for applications where a high degree of heat resistance is required. Results of physical tests shown in Table I on a typical black loaded GR-S compound accelerated with 1.5% Thionex and 0.75% sulfur illustrate the excellent heat resistance that is obtainable with this combination.



Typical results obtained on black GR-S compound accelerated with Thionex

TABLE I

		Aged in 100° C. Oven	
	Original	2 Days	4 Days
Stress at 200% Elongation—psi	725	775	850
Tensile Strength at Break—psi	2675	2550	2250
Elongation at Break—%	440	410	370
Hardness—Shore Durometer	61	65	67

THE UNIQUE PROPERTIES of Thionex either as a primary or as a secondary accelerator are well known from experience with rubber. This accelerator is considerably more versatile in GR-S, since it can be activated with other accelerators, such as 2-MT, DPG, Accelerator 808, etc., to produce fast curing, economical, high quality stocks, or it may be used as a secondary accelerator to activate Zenite, 2-MT, MBTS, Acrin and others.

SUGGESTIONS

1. When used with Polyac, Thionex is equal in effectiveness to Thiuram M in GR-I compounds.
2. An informal report covering the status of du Pont Rubber Colors has been published.

DU PONT
RUBBER CHEMICALS DIVISION
BETTER THINGS FOR BETTER LIVING . . . Through Chemistry

India Rubber World, August, 1944, Vol. 110, No. 5. Published monthly by Bill Brothers Publishing Corp., 1309 Noble Street, Philadelphia 23, Pa. Editorial and advertising offices, 386 Fourth Avenue, New York 16, N. Y., U. S. A. Entered as second-class matter October 5, 1889, at the Post Office at Philadelphia, Pa., under the act of March 3, 1879. Subscription, United States and Mexico, $3.00 per year; all other countries, $4.00; single copies, 35 cents.

PUBLIC LIBRARY
AUG 18 1944
DETROIT

HYCAR PRICES REDUCED AGAIN

Fourth Time in Less Than Three Years

TODAY the price of Hycar OR-15 is 50c per pound, thanks to the fourth price reduction in less than three years. Prior to August, 1941 it was 77c per pound. The prices of Hycar OR-25 and Hycar OS-10 have also been reduced again, making the third time since their introduction early in 1943.

These substantial reductions have been made possible through steadily increasing production and more efficient operation. It has always been Hycar's policy to pass along such economies to industry.

Price Schedule
Effective July 1, 1944

	Price per Lb. Standard 100 lb. Containers	Price per Lb. Less than Standard Container	Specific Gravity
Hycar OR-15	$0.50	$0.65	1.00
Hycar OR-25	0.45	0.60	0.98
Hycar OS-10	0.45	0.60	0.98

Prices are net and F. O. B. Akron, Ohio

WPB order R-1 as amended July 1, 1944 has considerably widened permitted uses of Hycar to include curb pump hose, V-belts, and many other items. For any application in which you are interested that is not now permitted, we suggest that you apply to the War Production Board, as a further broadening of allowed uses is anticipated. Shipments up to 200 pounds per month for experimental purposes are permissible without allocation. Our Customer Service Laboratory is always ready to assist you in your experimental work. *Hycar Chemical Company, Akron 8, Ohio.*

Hycar
Reg. U. S. Pat. Off.

LARGEST PRIVATE PRODUCER OF BUTADIENE TYPE

Synthetic Rubber

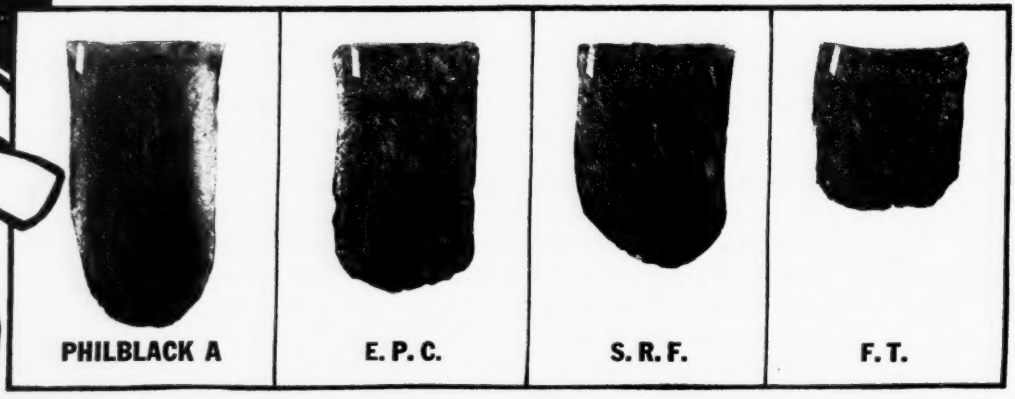
NEW TYPE BLACK

Saves Processing Time . . . Improves Finished Product

PHILBLACK A is the new HMF type black which combines the better properties of channel and furnace blacks, reduces processing time, and produces a high quality product.

Below are unretouched photographs that compare the reduction in nerve obtained by use of PHILBLACK A with that obtained by representative Easy Processing Channel Black, Semi-Reinforcing Furnace Black and Fine Thermal Black.

EQUAL VOLUME MILLED BATCH, 50 PARTS LOADING



These properties for varying amounts of loading are further illustrated in the booklet, "PHILBLACK A". Write for your copy and samples, for your own verification.

PHILLIPS PETROLEUM COMPANY

Philblack Division

FIRST CENTRAL TOWER • AKRON, OHIO

WHEN YOU HAVE A CHOICE CHOOSE THE BEST

With the recent rapid progress in conversion to synthetic products, compounds have had to be a compromise between the best and the most available.

Now that the best is available there is no reason for not specifying

BJF

The Naugatuck accelerator for

TIRES • CAMELBACK • SOLES and HEELS

AND ALL PRODUCTS WHERE

- **Abrasion**
- **Crack Growth**
- **Flat Curing Range**
- **Safety in Processing**

ARE IMPORTANT FOR SERVICE

WRITE FOR BULLETIN: *"BJF—ACCELERATOR FOR GR-S"*

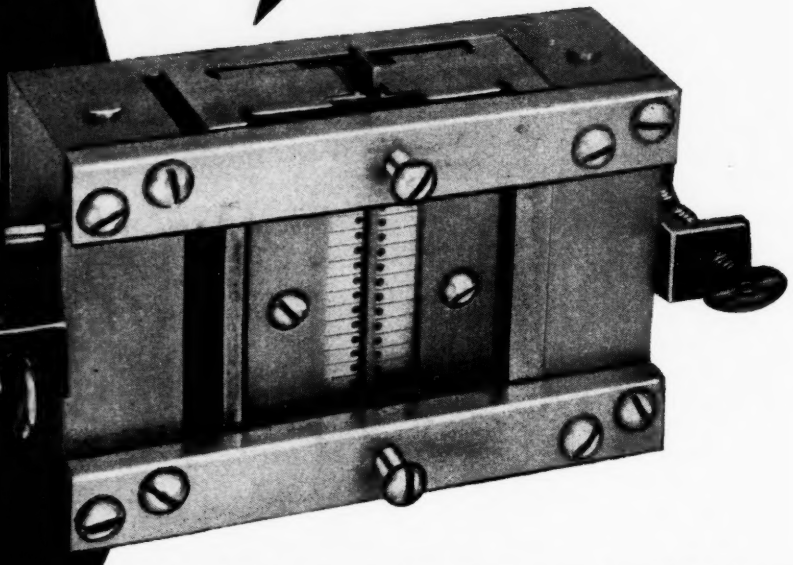
PROCESS • ACCELERATE • PROTECT
with Naugatuck Chemicals

Naugatuck Chemical

DIVISION OF UNITED STATES RUBBER COMPANY
ROCKEFELLER CENTER NEW YORK 20, N. Y.

IN CANADA: *Naugatuck Chemicals Division, Dominion Rubber Co., Elmira, Ont.*

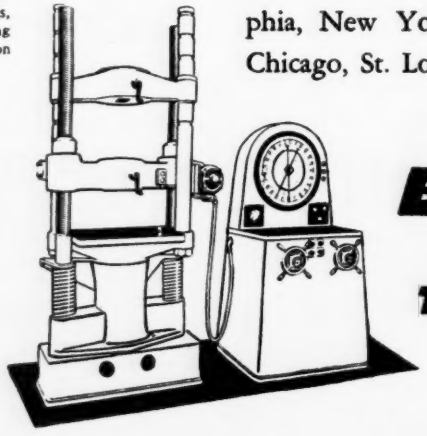
Here's a new jig that simplifies compression testing of sheet material



This simple inexpensive new jig speeds and facilitates the direct determination of compression yield strength of a single sheet of material. Sheet is restrained from lateral deflection by a number of small rollers. Extensometers are attached to the edge of the sheet. A real time-, trouble- and labor-saver for your laboratory The Baldwin Locomotive Works, Baldwin Southwark Division, Philadelphia, Pa., U.S.A. Offices: Philadelphia, New York, Washington, Boston, Cleveland, Chicago, St. Louis, Houston, San Francisco.

BALDWIN PRODUCTS

Hydraulic presses, Testing equipment, Steel forgings and castings, Diesel-electric locomotives, Diesel engines, Metal plate fabrication, Rolled steel rings, Bronze castings, Heavy machine work, Crane wheels, Bending rolls, Plate planers, Babbitt metal, Alloy iron castings, Briquetting presses.



BALDWIN

SOUTHWARK

TESTING EQUIPMENT

For the RUBBER Industry

A NEW TACKIFIER

PENTACIZER 344

USES: As a Tackifier and softener for synthetic rubbers

AVAILABILITY: Commercial quantities

PROPERTIES:

APPEARANCE — Brown, Resinous, Friable Powder

SOLUBLE IN — Acetone, Benzene, Linseed Oil
Buna S Types, Buna N Types

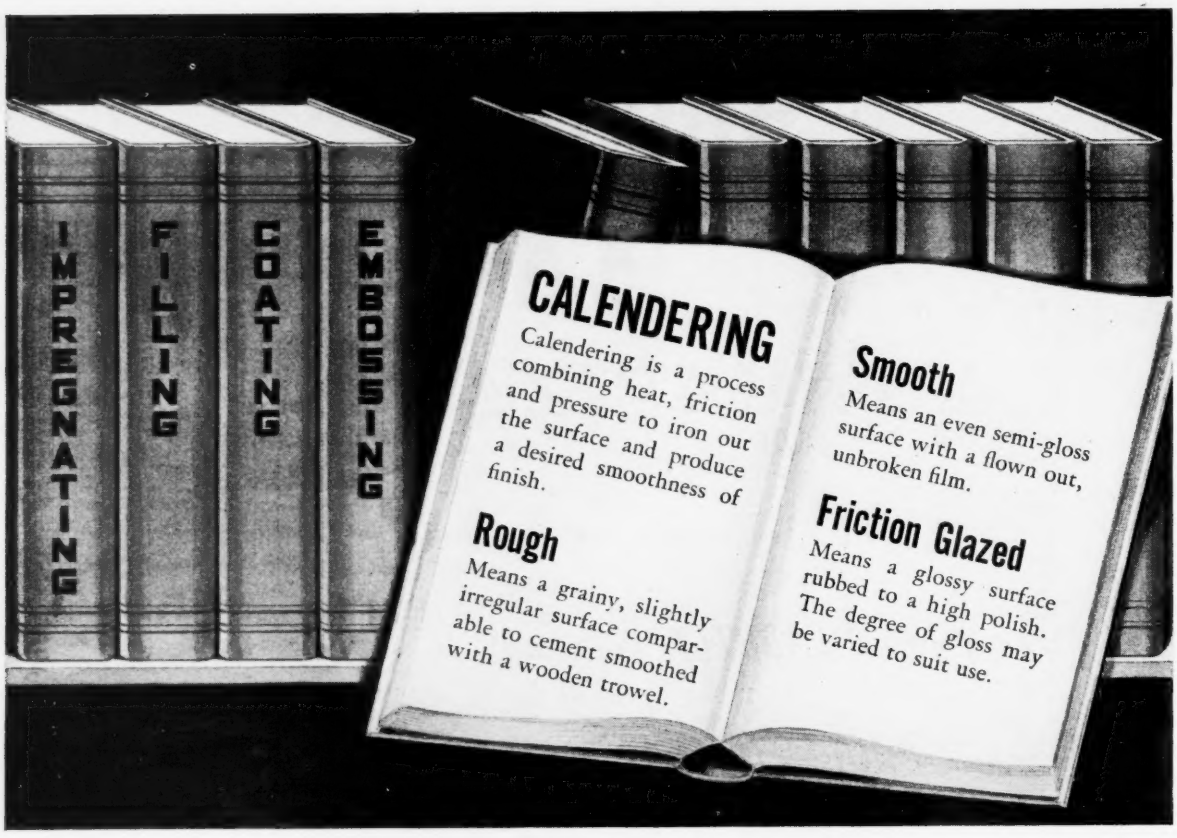
FINE HEYDEN CHEMICALS

Samples and further information upon request

HEYDEN CHEMICAL CORPORATION

393 SEVENTH AVENUE • NEW YORK 1, N. Y.

BRANCH: 180 NO. WACKER DRIVE, CHICAGO 6, ILL.


IMPREGNATING
FILLING
COATING
EMBOSSING
CALENDERING
Calendering is a process combining heat, friction and pressure to iron out the surface and produce a desired smoothness of finish.
Rough
Means a grainy, slightly irregular surface comparable to cement smoothed with a wooden trowel.
Smooth
Means an even semi-gloss surface with a flown out, unbroken film.
Friction Glazed
Means a glossy surface rubbed to a high polish. The degree of gloss may be varied to suit use.

Making CLOTH *serve more ways*

Cloth as woven, is a structural base in or upon which may be built many colorings, finishes and coatings.

Cloth is flexible, has high tensile strength and is very durable. By special processing, cloth serves many purposes. Combining cloth with plastic types of fillings and coatings opens up many new industrial use possibilities.

Our business is specialty finishing of cloth to special needs. Our research department is devoted to perfecting and developing these processes.

CURRENT HOLLISTON PRODUCTION

includes COATED and IMPREGNATED FABRICS . . . INSULATING CLOTH BASE . . . SEPARATOR CLOTHS rubber, starch-filled, glazed. TRACING AND BLUE PRINT CLOTHS white and blue, ink or pencil. MAP CLOTH, PHOTO CLOTH, self-adhesive. REINFORCING FABRICS. SIGN, LABEL AND TAG CLOTHS, waterproof to take any ink, meet any inking problem. BOOK-BINDING CLOTHS. SHADE CLOTH, impregnated waterproof, opaque, translucent or light proof.

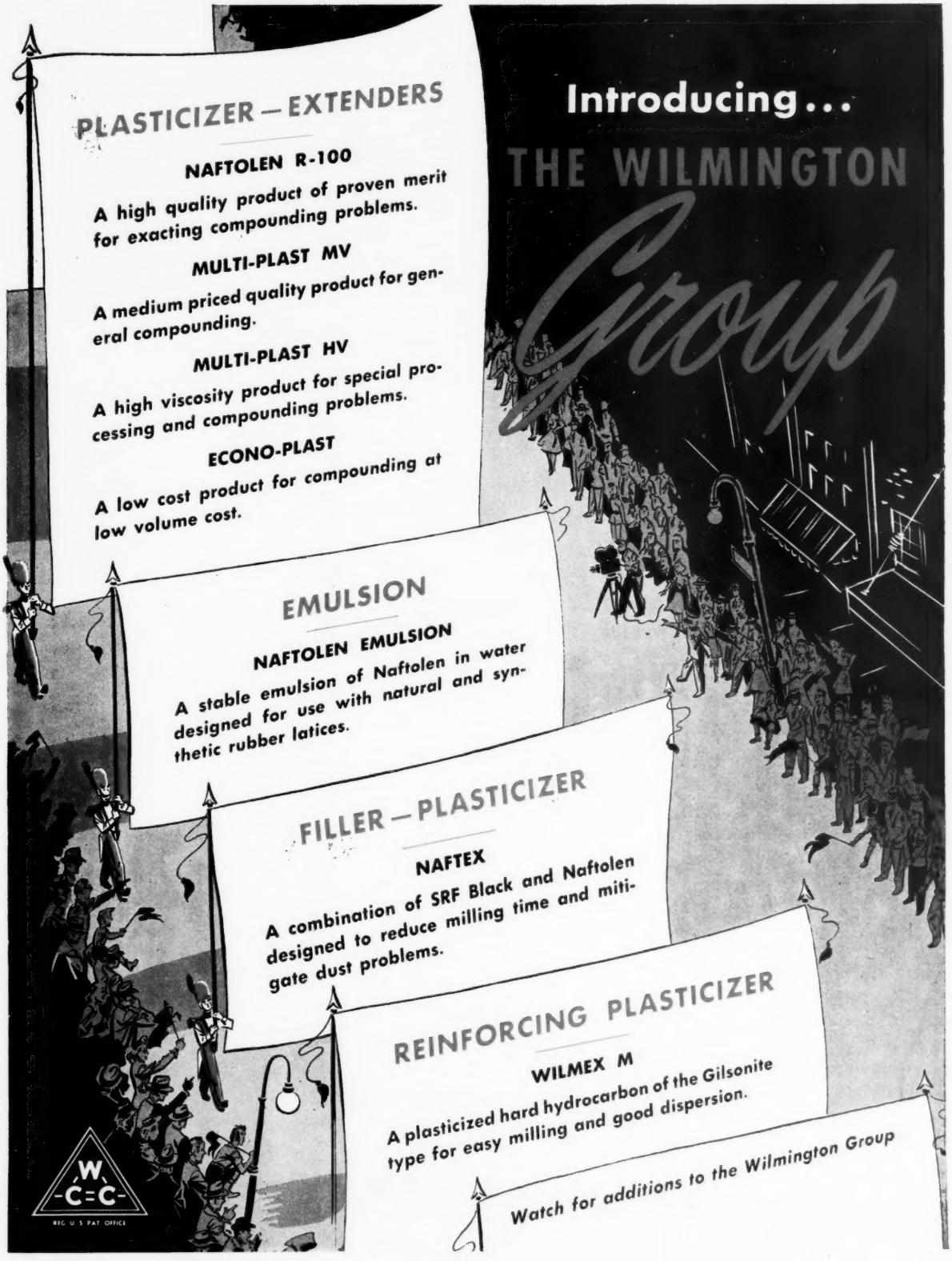
We urge you to consider CLOTH; and invite you to consult with us concerning possibilities and developments for your specific requirements.

The Holliston Mills, Inc.

PROCESSORS OF CLOTHS FOR SPECIAL PURPOSES

NORWOOD, MASSACHUSETTS

Sales Agents in Principal Cities


Introducing...
THE WILMINGTON
Group
PLASTICIZER—EXTENDERS
NAFTOLEN R-100
A high quality product of proven merit for exacting compounding problems.
MULTI-PLAST MV
A medium priced quality product for general compounding.
MULTI-PLAST HV
A high viscosity product for special processing and compounding problems.
ECONO-PLAST
A low cost product for compounding at low volume cost.
EMULSION
NAFTOLEN EMULSION
A stable emulsion of Naftolen in water designed for use with natural and synthetic rubber latices.
FILLER—PLASTICIZER
NAFTEX
A combination of SRF Black and Naftolen designed to reduce milling time and mitigate dust problems.
REINFORCING PLASTICIZER
WILMEX M
A plasticized hard hydrocarbon of the Gilsonite type for easy milling and good dispersion.
Watch for additions to the Wilmington Group
W
C=C
REG U S PAT OFFICE

WILMINGTON CHEMICAL CORPORATION

10 East 40th Street, New York 16, N. Y.

TRUE before the war, it still is a true picture of one of the blessings of the coming peace.

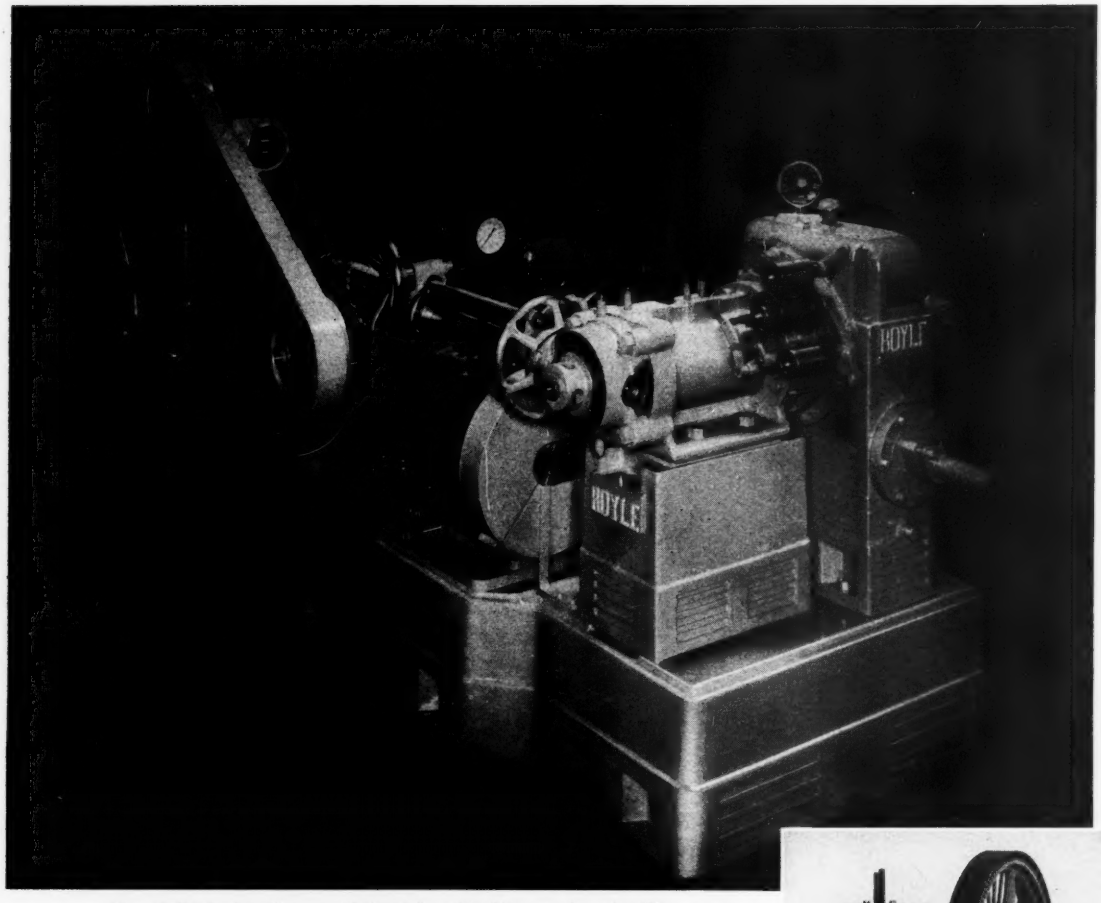
White rubber goods have practically disappeared, which indicates an extraordinary demand for them when the barrier is raised.

TITANOX will be ready with ample stocks of pigments and more and better technical information.

Meanwhile it is worth remembering that just as TITANOX pigments have the greatest whitening effect on natural rubber, so also do they have on GRS and reclaim.

TITANIUM PIGMENT CORPORATION
SOLE SALES AGENT
111 Broadway, New York 6, New York · 104 South Michigan Avenue, Chicago 3, Illinois
350 Townsend Street, San Francisco 7, California
2472 Enterprise Street, Los Angeles 21, California

TITANOX
REG. U.S. PAT. OFF.



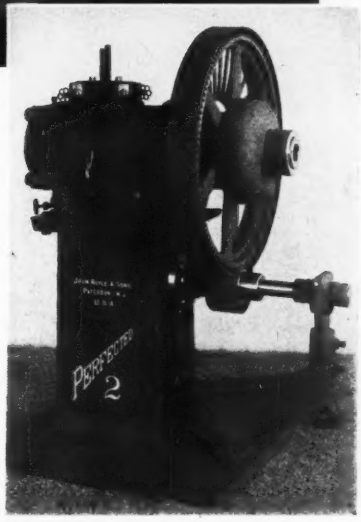
No. 2 Royle Continuous Vulcanizing Machine equipped with Stock Screw Speed Tachometer and Sperry Exactor Control.

DESIGNED TO DO THE JOB

For more than twenty years Royle Tubing Machines were built and sold on a theory—the theory that it would be practical to form seamless tubing by forcing rubber through a die under screw pressure. That was the inception of the continuous extrusion process.

As the veil of secrecy surrounding manufacturing processes and goals was lifted the uses and efficiency of Royle Tubing Machines expanded. Better products were produced at lower cost.

Today Royle Extruding Machines are designed to the job. Into them goes all the experience acquired during sixty-four years of pioneering in the manufacture of continuous extrusion machinery.



No. 2 Royle Tubing Machine of 1905

JOHN ROYLE & SONS

ROYLE PATERSON N. J.

PIONEER BUILDERS OF EXTRUSION MACHINES SINCE 1880

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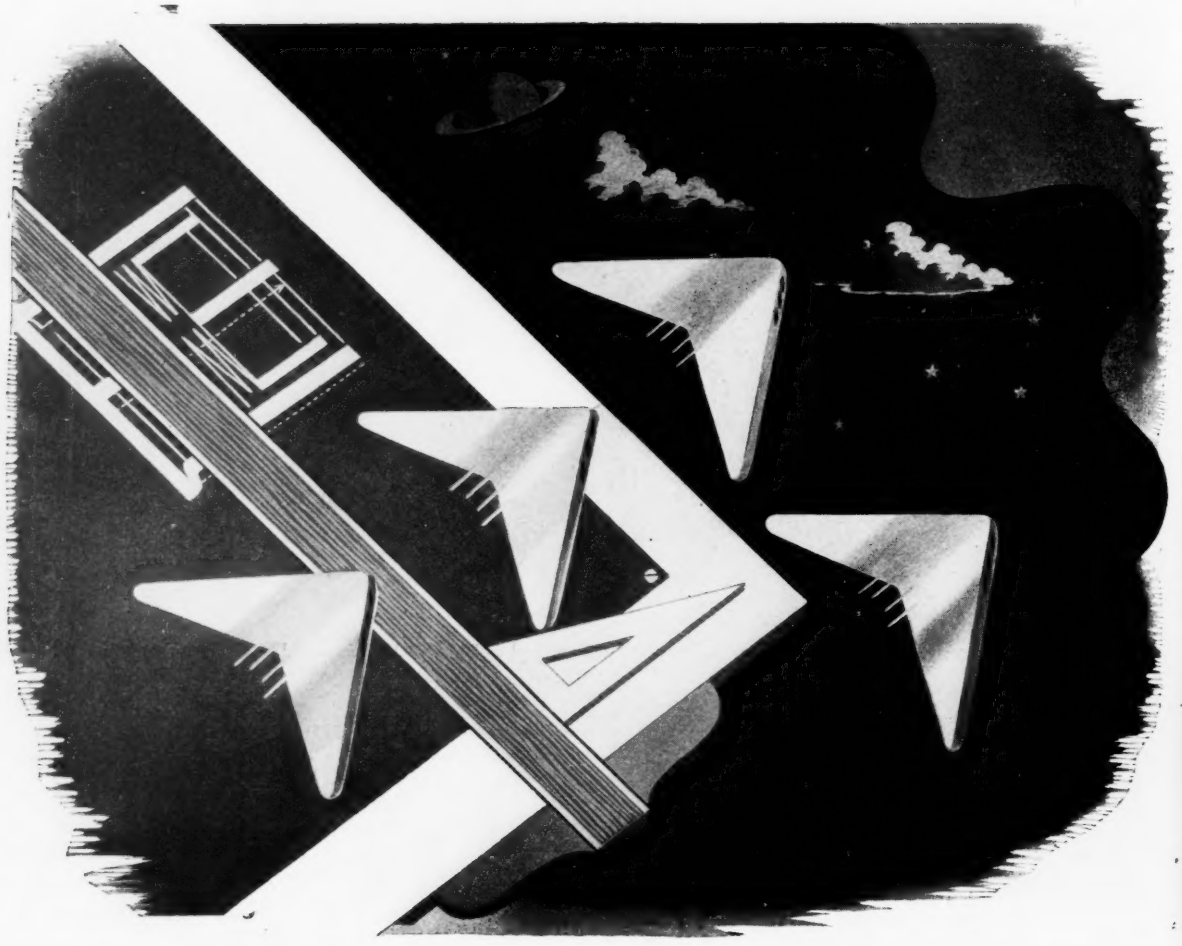
London, England

Home Office
B. H. Davis J. W. VanRiper
SHerwood 2-8262

Akron, Ohio
J. C. Clinefelter
UNiversity 3726

PATERSON 3, NEW JERSEY

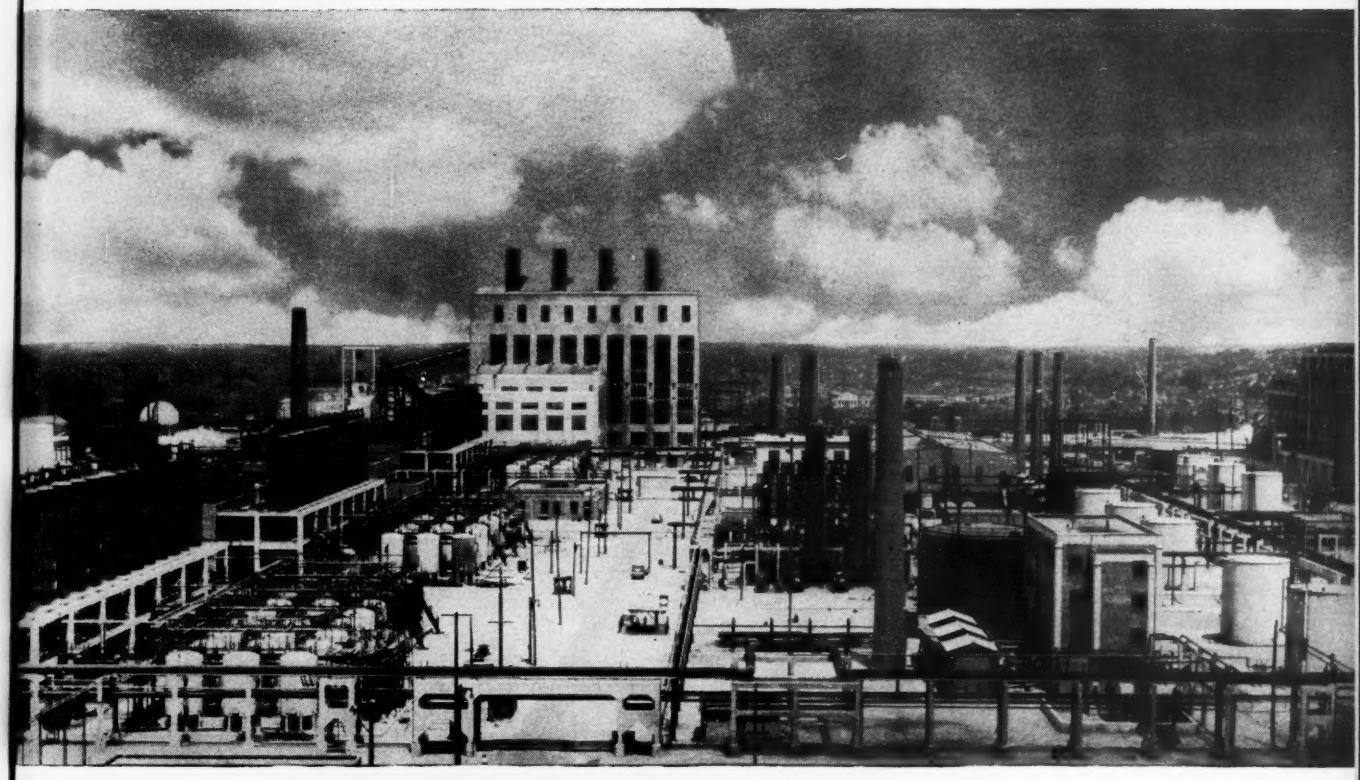


FRONTIERS OF THE NEW WORLD

We're in a new world . . . politically and industrially. War, with its veil of military secrecy, has made industrial transition ... present and impending . . . particularly difficult to appreciate. But it is a fact. For example: product finishing has seen the birth of new bases, new applications and new techniques so startling, so revolutionary, that no business can conceivably remain unaffected. Don't overlook this new world of chemistry in your post-war planning. Our staff of expert finishing engineers will be glad to cooperate with your organization. Your inquiry incurs no obligation. Address The Stanley Chemical Company . . . manufacturers of Stanley Lacquers, Synthetics, Enamels and Japans . . . East Berlin, Connecticut.

Stanley Chemical

Here's what Koppers has done on synthetic rubber chemicals



Koppers reports to the nation on Kobuta's first year's production of Synthetic Rubber Chemicals

The 200-acre Kobuta Plant built and operated by Koppers for the Government—producing butadiene and styrene—is one of the largest synthetic rubber chemical operations in America.

A year ago last July, its first butadiene was shipped. Now the plant makes more butadiene in one day than it did in that historic first month, and it makes great quantities of styrene as well.

In July, 1943, only one unit was operating. By October, three were in operation. That month Kobuta manufactured more butadiene than the designed rating of all four units. Since completion of the last unit in December, butadiene output has exceeded 150% of rated capacity.

Although only one unit has been in operation a full year, the butadiene production during the first 12 months equaled 120% of the 80,000-ton rated capacity.

Kobuta is also producing styrene in excess of its rated capacity of 37,500 tons per year.

These important synthetic rubber chemicals are processed by the rubber companies into tires and other products for the war and for you.

Approximately 30,000,000 standard tires per year can be produced from Kobuta's butadiene and styrene.

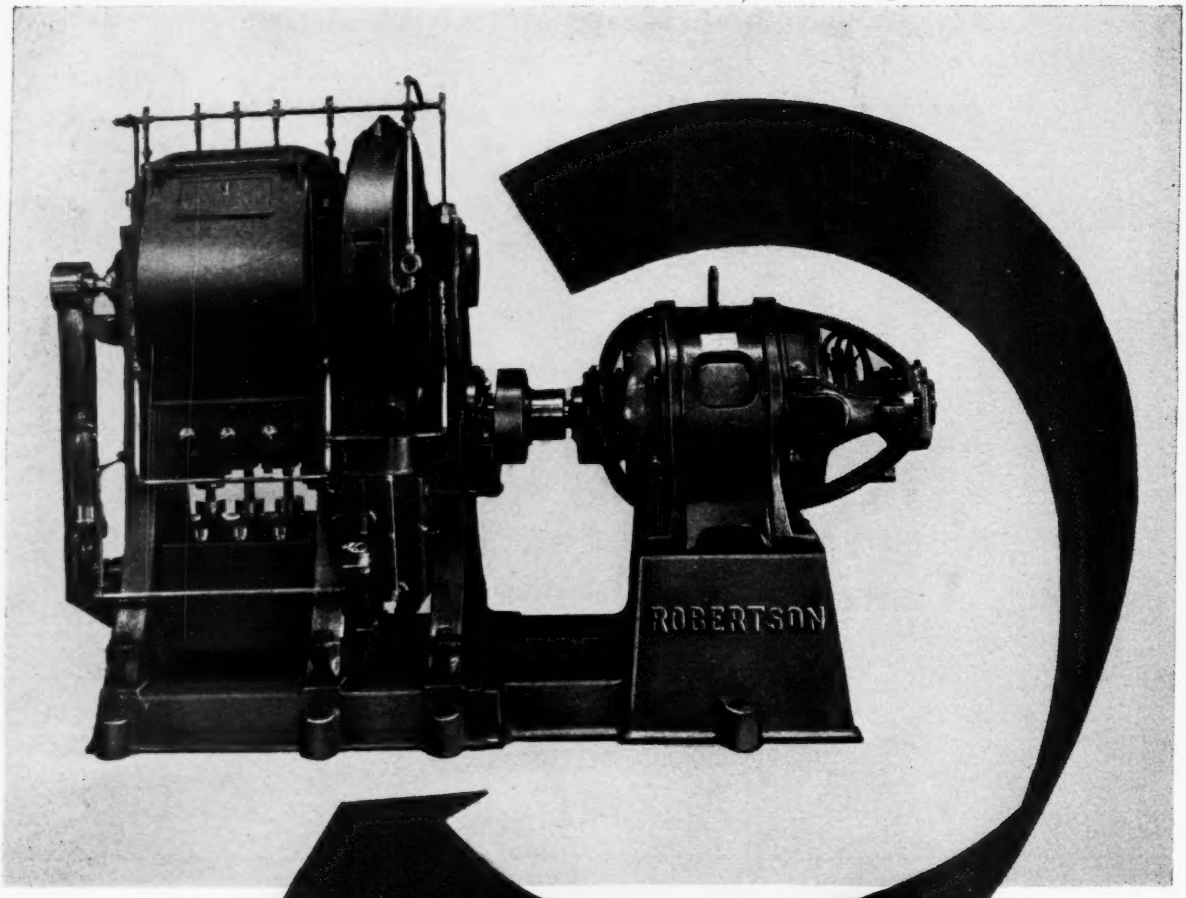
.....

AN ACKNOWLEDGMENT:

Koppers acknowledges the help of those who contributed to this great record, including other chemical companies who made processes available to us; manufacturers, engineers and contractors whose equipment, services and "know how" helped in Kobuta's construction; labor which provided thousands of workmen for this giant project, and government agencies, cooperating with educational institutions, which organized special chemical training programs. Koppers United Company, Pittsburgh 19, Pennsylvania.

KOPPERS

The Industry that serves all Industry



It's nothing new

. . . no, it's nothing new that Robertson introduces another *improvement! An excellent machine gains new productivity with a change that has taken time to develop. For over 86 years John Robertson, Inc. has striven to offer its clients all kinds of efficient Hydraulic Equipment.

Robertson machinery has long done an exceptional job by increasing Production output—Reducing cost and Improving efficiency in the plants of many of America's leading manufacturers of Rubber Hose and Cable.

*The new number 50 with eccentrics closed in and with the lubrication pump drive accomplished through bevel gears and shafting instead of through a chain. This arrangement makes it possible to have the circulating pump for the oil at the oil tank level so there is never any need for priming the lubrication pump. These new features will also be used in the numbers 60, 70, 80, and 90 pumps.

JOHN Robertson

125-135 WATER STREET, BROOKLYN 1, NEW YORK
Designers and Builders of all Types of Lead Encasing Machinery
Since 1858

MEETING THE MEASURE OF YOUR PROCESSING REQUIREMENTS

WITCO BLACK #12 ... an extremely easy processing black of lower hysteresis than standard channel blacks. It is readily compounded without affecting the tensile, modulus or elongation, and is being used with highly satisfactory results in natural, synthetic and reclaim rubber processing. Witco Black No. 12 is a product of exceptionally uniform particle size, produced under rigid control at the Witco Panhandle Plant. It may be the solution to your compounding problem. Why not talk it over with one of our technical representatives?

WITCO CHEMICAL COMPANY MANUFACTURERS AND EXPORTERS

[FORMERLY WISHNICK-TUMPEER, INC.]

295 MADISON AVENUE, NEW YORK 17, N. Y. • BOSTON • CHICAGO • DETROIT • AKRON • CLEVELAND • LONDON

A NEW BLACK "MAGIC"

Continex SRF

SEMI-REINFORCING FURNACE BLACK

Here at Continental's new New Furnace Black Plant, full scale production is now under way.

Continex SRF is a superior semi-reinforcing furnace type black . . . providing greater strength and loading capacity . . . giving the rubber a higher rebound resilience and longer service life.

Your orders for Continex SRF will be filled promptly.

CONTINENTAL CARBON COMPANY
MANUFACTURER
[CONTINENTAL CHANNEL AND FURNACE BLACKS]

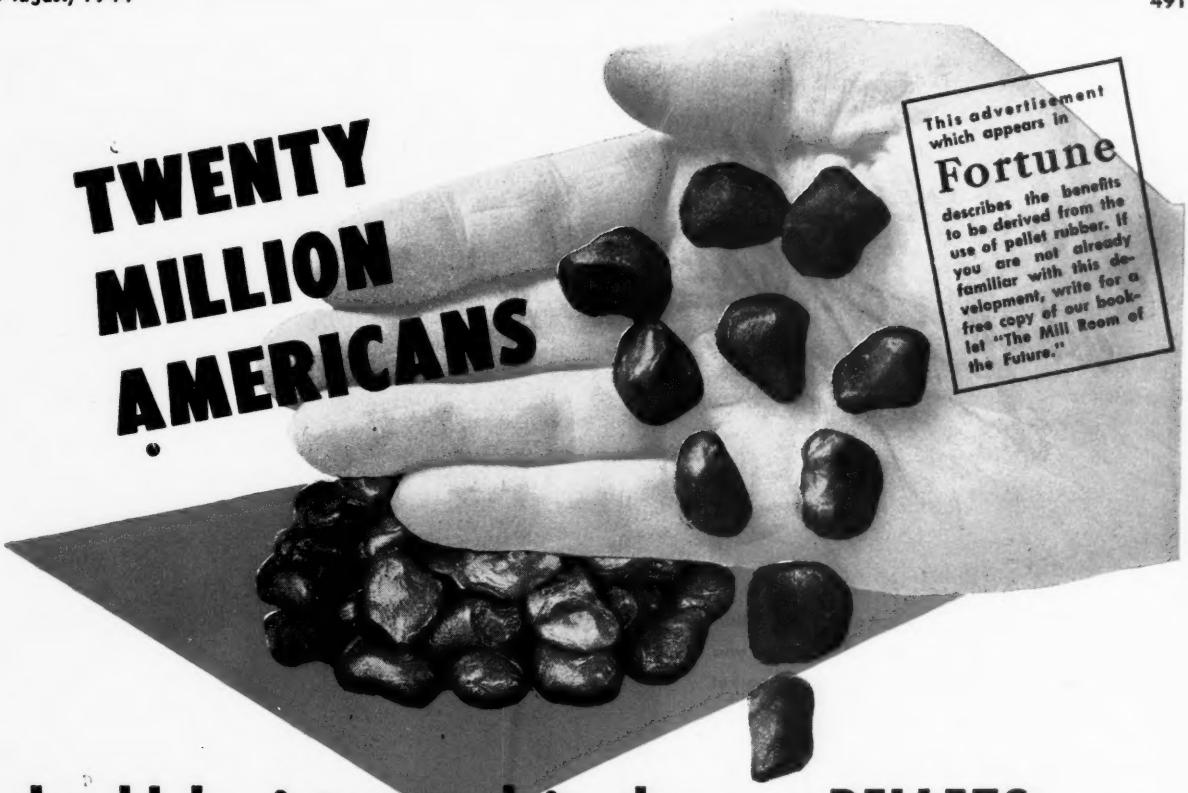
WITCO

WITCO CHEMICAL COMPANY
DISTRIBUTOR
[FORMERLY WISHNICK-TUMPEER, INC.]

MANUFACTURERS AND EXPORTERS

295 MADISON AVENUE, NEW YORK 17, N. Y. • Boston • Chicago • Cleveland • Akron • Detroit • London

TWENTY MILLION AMERICANS



This advertisement which appears in **Fortune** describes the benefits to be derived from the use of pellet rubber. If you are not already familiar with this development, write for a free copy of our booklet "The Mill Room of the Future."

should be interested in these PELLETS . . .

Thirty years ago the average price of automobile tires was $25, and the owner was lucky if the tire lasted for 2,500 miles. By 1940 the average price had dropped to $12, and tires were good for 20,000 to 25,000 miles.

This achievement in reducing tire costs from one cent to about a twentieth of a cent per mile seems doubly remarkable when the difficulties of handling and mixing rubber are realized.

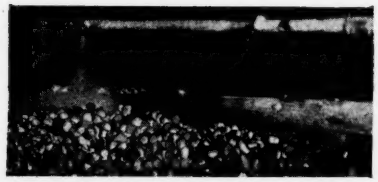
Since the very beginning of the industry, rubber has been piled, trucked and stored in bulky slabs or sheets. The high cost of such storage and handling is equalled by the cost of moving the stock to the compound room, cutting to weight, and transporting to the Banbury for mixing.

Farrel-Birmingham engineers, ever on the watch for ways to help customers reduce costs and improve product quality, developed a machine called the Hale Pelletizer. This machine transforms rubber into free-flowing pellets which can be transported on continuously moving conveyors and stored in space-saving overhead bins. Because rubber pellets multiply many times the surface area which comes in contact with carbon black and other pigments, the latter are absorbed faster, blended more thoroughly, and a more uniform mix of higher quality is obtained.

If past experience can be taken as a criterion for the future, it will be the twenty million car owners of America, and the many other millions who buy and use rubber products in forms other than tires, who will benefit by this *revolution* in rubber processing. For when pellet rubber is more widely adopted by manufacturers after the war, every dollar spent on rubber products will buy greater value.

This is a typical example of the engineering service Farrel-Birmingham has been rendering to the rubber and other industries for more than a century. Other developments include the Gordon Plasticator and Banbury Mixer for rubber and plastics, Farrel-Sykes continuous tooth herringbone gears—the famous *Gear with a Backbone*—and other high-precision, high-production machines and equipment.

FARREL-BIRMINGHAM CO., INC., ANSONIA, CONN.
Plants at Ansonia and Derby, Conn., Buffalo, N. Y.



Air and water are used to cool the pellets as they pass by on a continuous belt on their way to storage bins. Soapstone prevents their sticking together.

Farrel-Birmingham

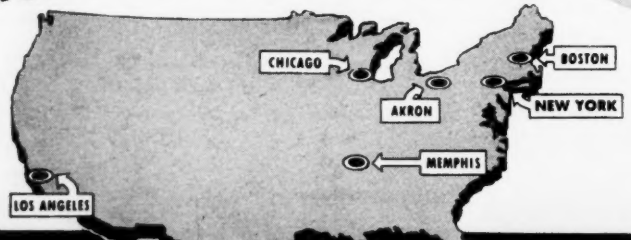
It's easy— when you have the "know-how"

With nearly 40 years of experience to its credit, it is only natural that our organization should have the "know-how" to assist you with rubber problems. Keep posted on market conditions...consult us frequently regarding

SYNTHETIC
CRUDE
SCRAP
Rubber

ALSO
HARD RUBBER DUST
and BALATA

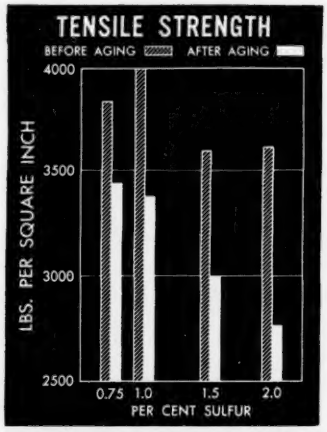
LET US SERVICE YOUR RUBBER RESERVE PERMITS

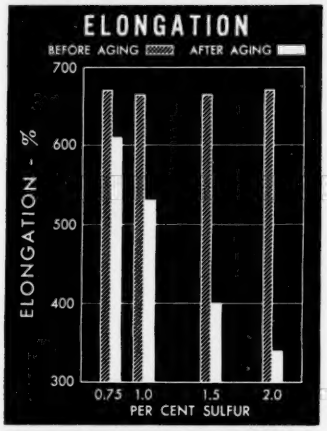


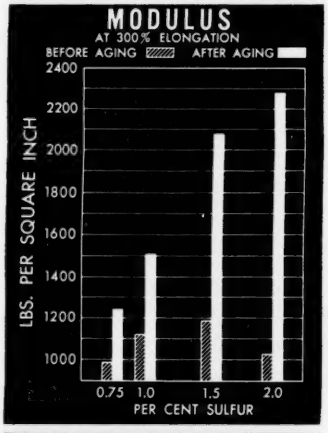
H. MUEHLSTEIN & Co. INC.

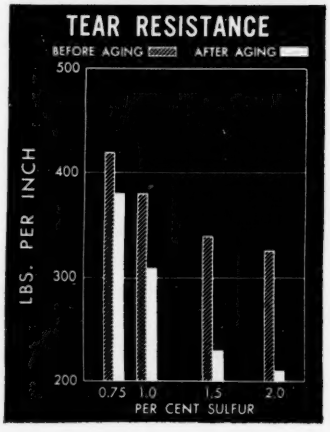
122 EAST 42nd STREET, NEW YORK 17, N. Y.

CHICAGO: 327 So. La Salle St. · AKRON: 250 Jewett St. · LOS ANGELES: 1431 E. 16 St. · MEMPHIS: 46 W. Virginia Ave. · BOSTON: 31 St. James Ave.









Give your GR-S Compounds heat stability provided by low sulfur content

Safe, fast curing now made possible by FBS LITHARGE

As you know, reduction in sulfur content means increase in heat stability.

It has now been demonstrated that FBS litharge (plus benzothiazyl disulfide) makes low sulfur formulas practicable.

Why?

Because it speeds up greatly the rate of cure without increasing the risk of scorching.

Thus, even though the normal quantity of accelerator is used, *the sulfur content can be reduced.*

Note, in the series of tests charted and tabulated, the superior behavior of the 0.75 and 1.0 sulfur formulas.

FORMULA

GR-S (Institute)	100
E.P.C. Carbon Black	50
Zinc Oxide	3
Coal tar softener	5
Benzothiazyl Disulfide	1.0
FBS Litharge	1.5
Sulfur	variable

Effect of Varying Amounts of Sulfur on Physical Properties

(Curing period: 20 min. Temp: 287° F.)

% Sulfur	*Tensile Strength*	*% Elongation*	*Modulus at 300% Elong.*	*Tear Resistance*
0.75	3840	670	980	420
1.0	4000	665	1120	380
1.5	3600	665	1190	340
2.0	3620	670	1025	325
After Aging 24 Hours at 100° C.				
0.75	3460	610	1240	380
1.0	3380	530	1510	310
1.5	3000	400	2080	230
2.0	2770	340	2280	210

CONCLUSIONS:

1. FBS Litharge-thiazole with low sulfur imparts heat stability.
2. Modulus is high and steady.
3. Elongation is retained despite exposure to heat.
4. Heat stability prevents brittleness and improves tear resistance.
5. Rate of cure is relatively fast, without tendency to scorch.
6. The combination is inexpensive and efficient.

Ask us to send you a printed report, "Compounding of GR-S for Heat Resistance," issued by the Rubber Division of our Research Laboratories, which covers the subject of FBS Litharge for low sulfur formulae in greater detail and from a number of additional angles.

NATIONAL LEAD COMPANY New York, Buffalo, Chicago, Cincinnati, Cleveland, St. Louis, San Francisco; Boston (National-Boston Lead Co.); Pittsburgh (National Lead & Oil Co. of Penna.); Philadelphia (John T. Lewis & Bros. Co.).

MILLIONS OF FEET TREAD SAFELY ON

HEELS AND SOLES USING RECLAIMED RUBBER

In yet another way reclaimed rubber is taking the place of a scarce material, — leather for heels and soles of army shoes. The substitution has been so successful that these now outwear the best leather under service conditions.

PEQUANOC RECLAIMS

are especially suitable for this because they are dependable and uniform in quality.

PEQUANOC RUBBER CO.

QUALITY RECLAIMS FOR SPECIFIC PURPOSES

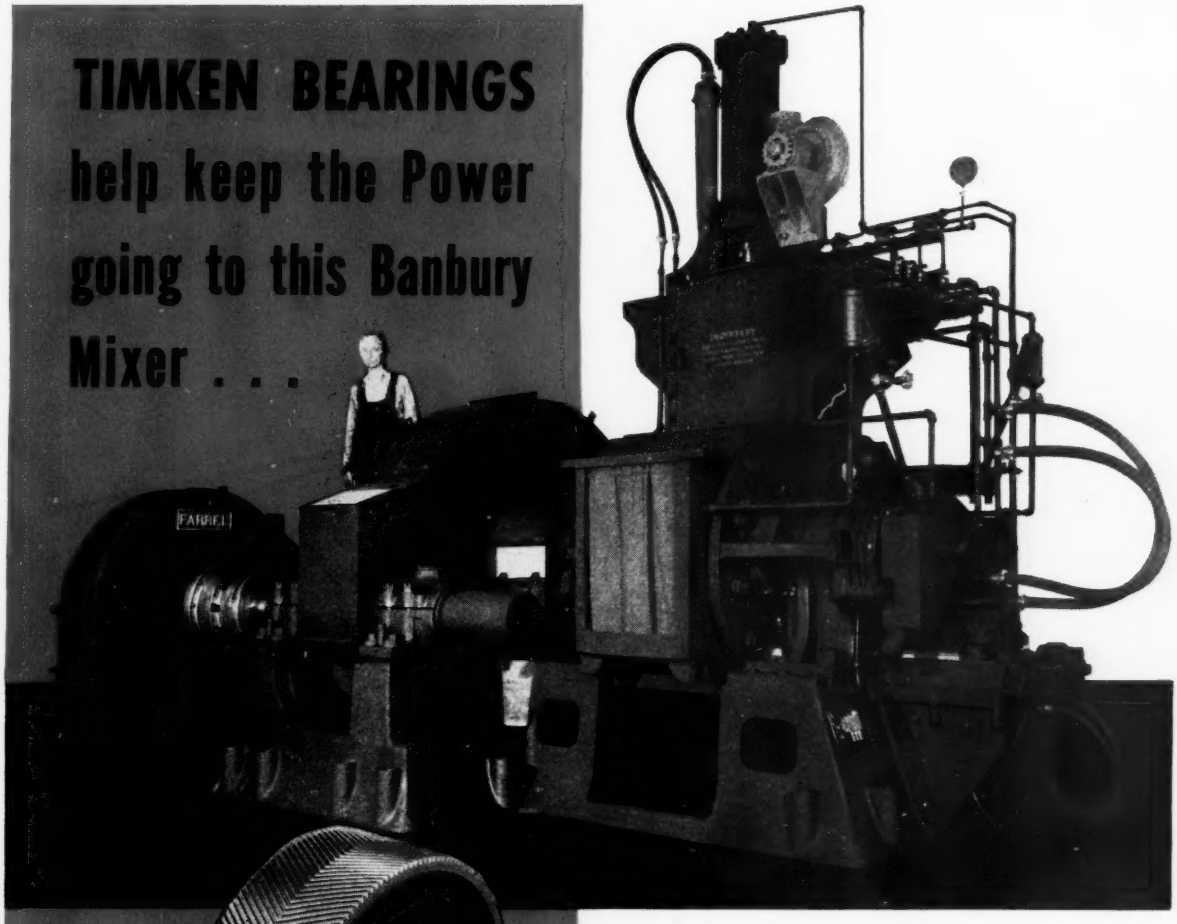
BUTLER NEW JERSEY

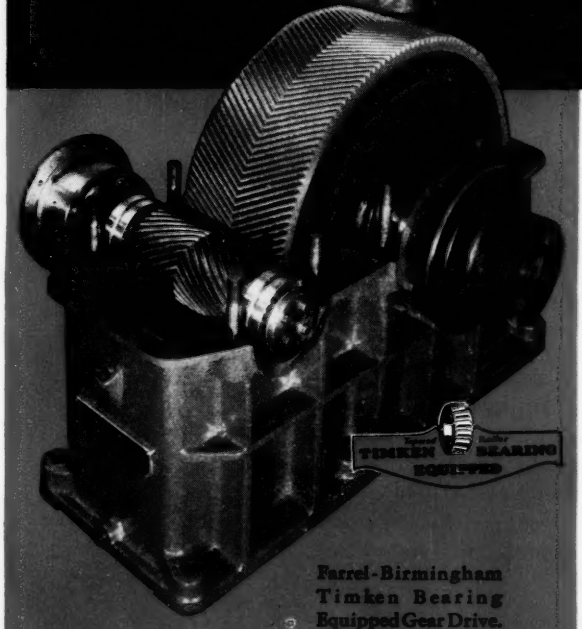
SALES REPRESENTATIVES

Harold P. Fuller
31 St. James Avenue
Boston, Mass.

Burnett & Co. (London) Ltd.
189 Regent Street
London W. 1, England

TIMKEN BEARINGS help keep the Power going to this Banbury Mixer . . .





Farrel-Birmingham Timken Bearing Equipped Gear Drive.

THE Size 11 Banbury Mixer and drive shown in the photograph are products of Farrel-Birmingham Company, Inc. This size and type of Banbury is extensively used for processing natural and synthetic rubbers and is operated by a 250/500 HP, 450/900 RPM motor drive for standard and double speed. The drive is equipped with Timken Tapered Roller Bearings on both the high and low speed shafts.

Farrel-Birmingham has had years of experience with Timken Bearings in gear drives for all kinds of service and knows they can be depended upon to eliminate friction; to keep radial, thrust and combined loads constantly under control; and to hold moving parts in correct and permanent alignment.

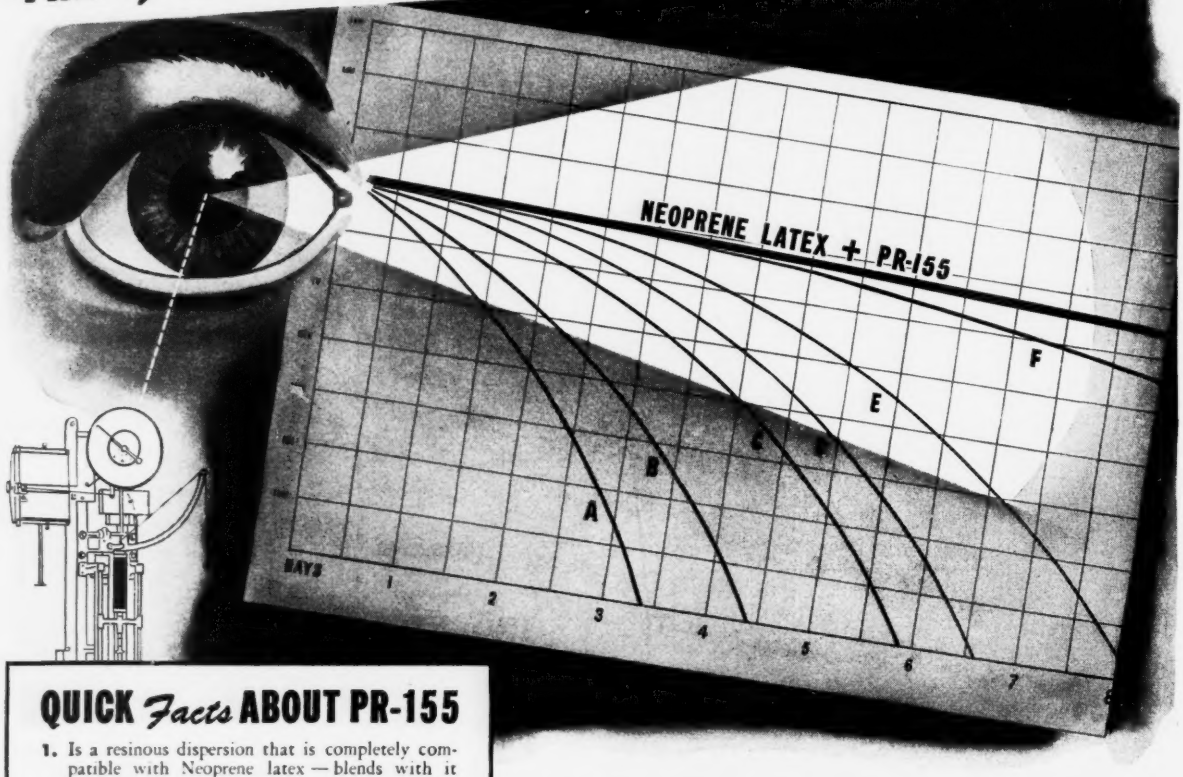
Combined with the finest material ever developed for anti-friction bearings (Timken Alloy Steel) and precision of manufacture, these qualities result in better performance; greater endurance; and lower operating and maintenance costs wherever Timken Bearings are applied. Make sure you get them when buying new equipment of any kind. The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

THE *Facts* ABOUT COMPOUNDING NEOPRENE LATEX



QUICK *Facts* ABOUT PR-155

1. Is a resinous dispersion that is completely compatible with Neoprene latex — blends with it intimately.
2. Produces Neoprene latex adhesives suitable for almost all former natural latex uses and possessing all the added advantages of oil resistance, etc. characteristic of Neoprene.
3. **Provides Neoprene latex adhesives which have pressure-sensitivity (dry tack) from a few hours up to 4 or 5 days, as desired.**
4. Contains necessary anti-oxidants and protective agents to insure proper ageing of the compounded adhesives.
5. Enables extension of Neoprene latex at substantial over-all savings. (Due to the unusually high strength of Neoprene, greater extension is possible in proportion to true rubber-like characteristics desired.)
6. Can be compounded with Neoprene latex in your own equipment, or UBS will compound and ship the desired finished adhesive to you.

Field Tests show UBS formulation PR-155 to be a most satisfactory Neoprene Latex Compound Base . . .

As the above graph illustrates, many dispersions, when compounded with Neoprene Latex, show definitely unsatisfactory ageing qualities. That's why users are so pleased with the bonding strength and lack of deterioration actual field tests show that PR-155 provides. The result of many years of practical experience compounding Neoprene, PR-155 is an original development of the UBS Laboratories. Write today for further information. Address your inquiries to the Union Bay State Chemical Company, Rubber Chemicals Division, 50 Harvard Street, Cambridge 42, Massachusetts.

For masking the basic odor of Neoprene Latex, we suggest using UBS Masking Perfume — Formula D6.

UBS

UNION BAY STATE
Chemical Company

Serving Industry with Creative Chemistry

ORGANIC CHEMICALS · SYNTHETIC LATEX · SYNTHETIC RUBBER
PLASTICS · INDUSTRIAL ADHESIVES · DISPERSIONS
COATING COMPOUNDS · IMPREGNATING MATERIALS · COMBINING CEMENTS

NET WEIGHT 50 LBS.
IXIE 40 DIXIE
UNITED CARBON COMPANY Inc.
DIXIE 40
DUSTLESS-CARBON BLACK
U.S.A.
IXIE 40 DIXIE
MADE IN U.S.A.
PATENTS APPLIED FOR

DIXIE 40

This latest furnace-process reinforcing carbon black (HMF type) for synthetic and natural rubber possesses a combination of most desirable characteristics—

- cool mixing
- easy processing
- smooth and rapid extrusion
- fast rate of cure
- full reinforcement
- low heat build-up
- high resiliency
- high resistance to cut growth, flex cracking and abrasion.

Dixie 40 is especially useful for tires of all types, pneumatic or solids, under any conditions; tubes, bogie wheels; footwear; and mechanical goods.

Try a 50-50 blend of Dixie 40 and channel black for tread stock to secure better plasticity. It will make it possible for you to dispense with one milling and thus—which is so important now—INCREASE YOUR OUTPUT.

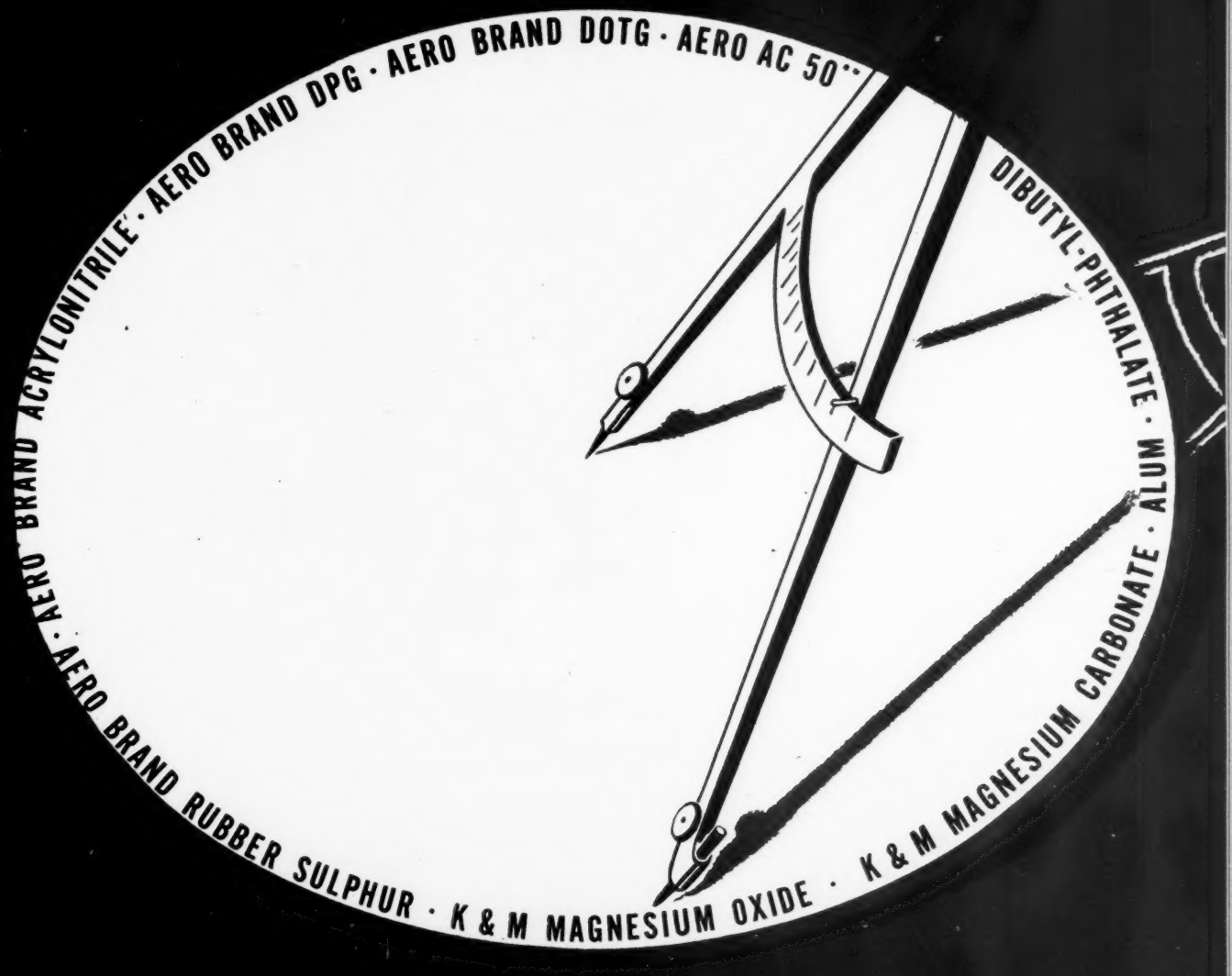
RESEARCH DIVISION

UNITED CARBON COMPANY, INC.

Charleston, West Virginia

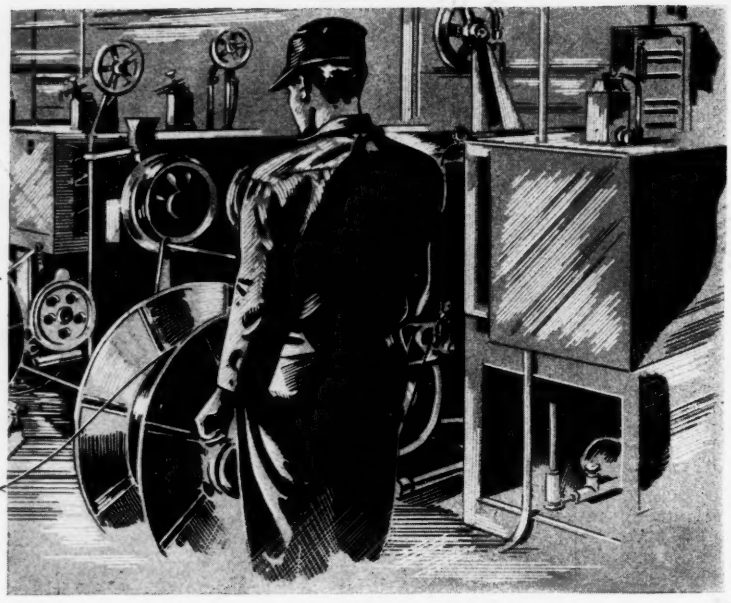
AERO BRAND ACRYLONI

A WELL-ROUNDED SERVICE TO THE RUBBER INDUSTRY


AERO BRAND ACRYLONITRILE · AERO BRAND DPG · AERO BRAND DOTG · AERO AC 50** · DIBUTYL PHTHALATE · ALUM · K & M MAGNESIUM CARBONATE · K & M MAGNESIUM OXIDE · AERO BRAND RUBBER SULPHUR

AMERICAN CYANAMID
& CHEMICAL CORPORATION
(A Unit of American Cyanamid Company)
30 ROCKEFELLER PLAZA . NEW YORK 20, N. Y.

An old idea, with a new twist in the WIRE BUSINESS...



A CATALOG that lists and describes National-Standard's steel wires, braids and tapes couldn't possibly picture the policies of the company. We believe these policies are as important as the products our company produces.

Many years of experience in the rubber industry has taught us that all customer problems cannot be treated alike—individual requirements cannot always be met with a fixed line of products and specifications.

The men of National-Standard have much deeper interests than mere catalog-type of selling. Their responsibilities do not end with the delivery of a product.

These men are constantly working with tire and hose engineers and mechanical goods men to not only improve their own products, but also those of the customer and to also find new and better methods of application.

It is this kind of cooperation and personalized service, and the willingness to be helpful that has built for National-Standard a reputation with the rubber industry as a reliable source for research and engineering assistance as well as for quality products.

If you've got a problem to solve, or an idea requiring a new use of steel wire, braids or tapes for rubber reinforcement, National-Standard's experienced engineering staff is ready to serve you.

NATIONAL STANDARD *Company*

Divisions of National-Standard Company

NATIONAL-STANDARD
Niles, Mich.
TIRE WIRE, FABRICATED BRAIDS AND TAPE

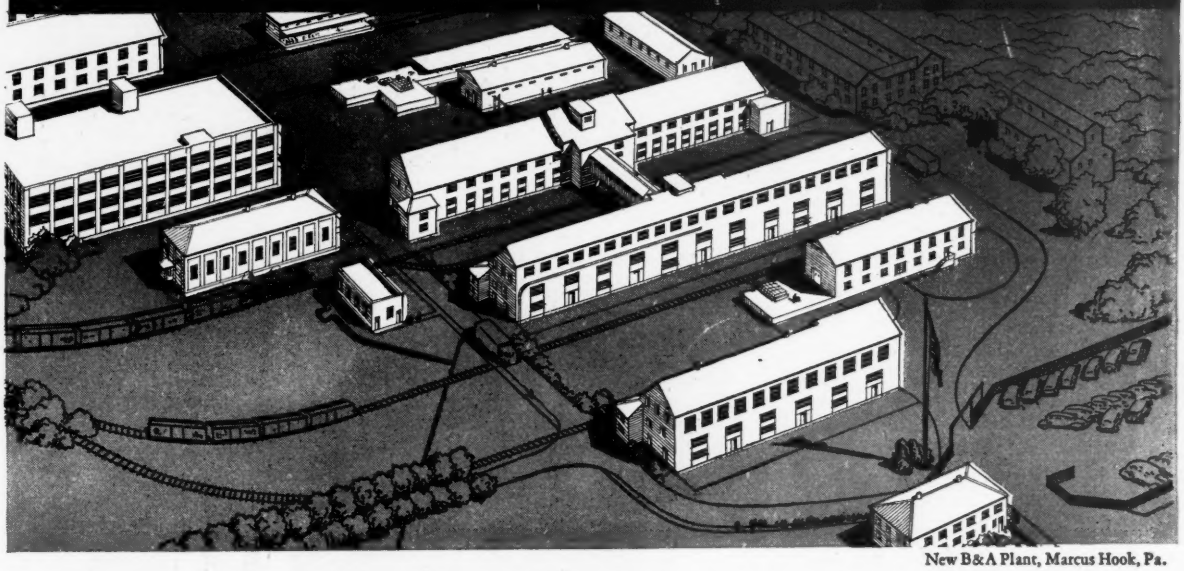
ATHENIA STEEL
Clifton, N. J.
COLD ROLLED, HIGH-CARBON SPRING STEEL

WAGNER LITHO MACHINERY
Hoboken, N. J.
LITHOGRAPHING AND SPECIAL MACHINERY

WORCESTER WIRE WORKS
Worcester, Mass.
ROUND STEEL WIRE, SMALL SIZES

BACK THE ATTACK—BUY MORE WAR BONDS

AGAIN *GENERAL CHEMICAL* CREATES NEW FACILITIES FOR BAKER & ADAMSON PRODUCTS TO SERVE AMERICAN INDUSTRY!



New B&A Plant, Marcus Hook, Pa.

THESE NEW FACILITIES for production of Baker & Adamson reagent and fine chemicals provide ideal manufacturing areas, additional research and development laboratories, and special storage and shipping accommodations. This plant's output, coupled with that of other Baker & Adamson producing units and distributing stations throughout the United States, marks another forward step in Baker & Adamson leadership.

Basic materials for many Baker & Adamson quality products made here come directly from sixteen of General Chemical Company's producing locations. With such fundamental sources of supply, including many Company-owned mines for raw materials, Baker & Adamson is in a pre-eminent and unique position for meeting the expanding uses of high-purity chemicals in industry.

Whether you require laboratory reagents, fine chemicals, or other products prepared in accordance with your formulae—avail yourself of the Baker & Adamson facilities. Experienced technical service representatives are ready to discuss *your* chemical problems and requirements. Baker & Adamson stocks are carried in many principal cities!

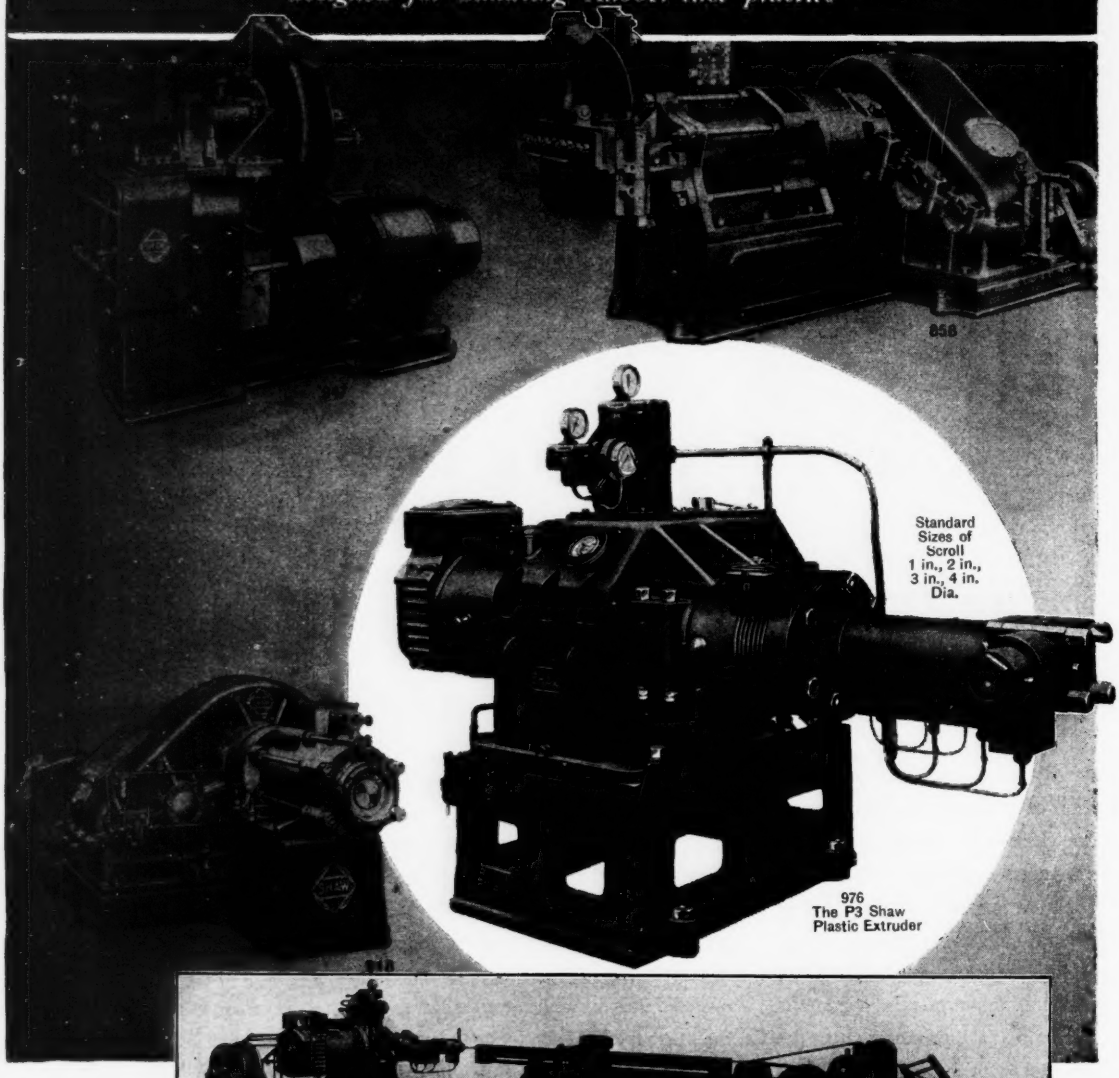
GENERAL CHEMICAL COMPANY

Fine Chemicals for Industrial America

GENERAL CHEMICAL COMPANY
40 RECTOR STREET, NEW YORK 6, N. Y.

SHAW RUBBER EXTRUDERS HAVE BEEN OUTSTANDING FOR OVER 60 YEARS

The latest addition to the range is an extruder specially designed for handling Rubber-like plastics

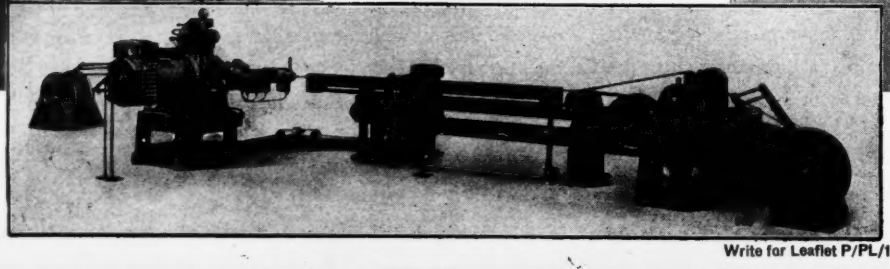


858

Standard Sizes of Scroll 1 in., 2 in., 3 in., 4 in. Dia.

976
The P3 Shaw Plastic Extruder

948



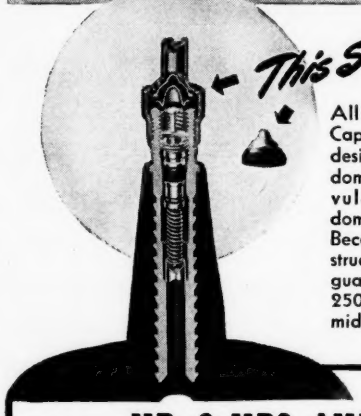
The P2 Extruder With Unit Driven Haul Off & Wind Up Gear . . . . .

Write for Leaflet P/PL/101

SHAW

FRANCIS SHAW & CO. LTD. MANCHESTER 11 ENGLAND

PL109



All Standard Schrader Valve Caps contain this specially designed sealing unit with a dome-shaped rubber washer vulcanized between two dome-shaped BRASS plates. Because of their unique construction, these caps are guaranteed airtight up to 250 lbs. pressure. This mighty midget does the work.

MR. & MRS. AMERICA

A flat or underinflated tire on the road today may mean no car to drive tomorrow. Don't let this happen to you. Check your tires now. Are they properly inflated? Is there a cap on each tire valve? Airtight Schrader valve caps are available in the familiar red, white and blue package wherever gas or tires are sold—or tires are serviced.

Schrader
CONTROLS THE AIR

You wouldn't use a donkey if your tires gave out? Perhaps not—but if you couldn't get new tires, you wouldn't drive your automobile either. And actually the situation is that serious. No new tires are in prospect for most of us for a long time. Therefore, if you want to keep on driving, be sure your tires are properly inflated NOW—for underinflation ruins tires.

The easiest and most effective way to prevent costly, destructive tire wear is to keep your air pressure up—for a 6.00 x 16 tire underinflated only 6 lbs. (as an example) loses 30% of its mileage. The remedy is simple. Put air in. Keep air in. Be sure that every tire valve has a Schrader tire valve CAP to *seal* that air in. Screwed down fingertight, these caps prevent leakage through the valve mouth. And—remember—it's that last turn that makes the absolute seal.

NEXT TIME YOU GET GAS

Get Air—Get AIRTIGHT CAPS

SOLD EVERYWHERE

A. SCHRADER'S SON, *Division of Scovill Manufacturing Company, Incorporated*, BROOKLYN, NEW YORK

Reclaim

WE SPECIALIZE IN THE

SCRAP RUBBER

THAT MAKES THE RECLAIM

Associated exclusively with rubber since 1868, we have served the reclaimers since the inception of their industry. Our trained and experienced organization insures the perfect selection and grading of rubber scrap—which means satisfaction of our customers.

Our long experience and extensive facilities are at your service.

THE LOEWENTHAL CO.

JACK SIDER, *President* J. K. McELLIGOTT, *Exec. Vice-Pres.*

We Solicit Your Inquiries

188 W. RANDOLPH STREET
CHICAGO 1, ILL.

159 CLEWELL STREET
AKRON 5, OHIO

Cable Address: "Gyblowell"

P

Ch

SHELL DUTREX 6

Plasticizer and Extender for GR—S

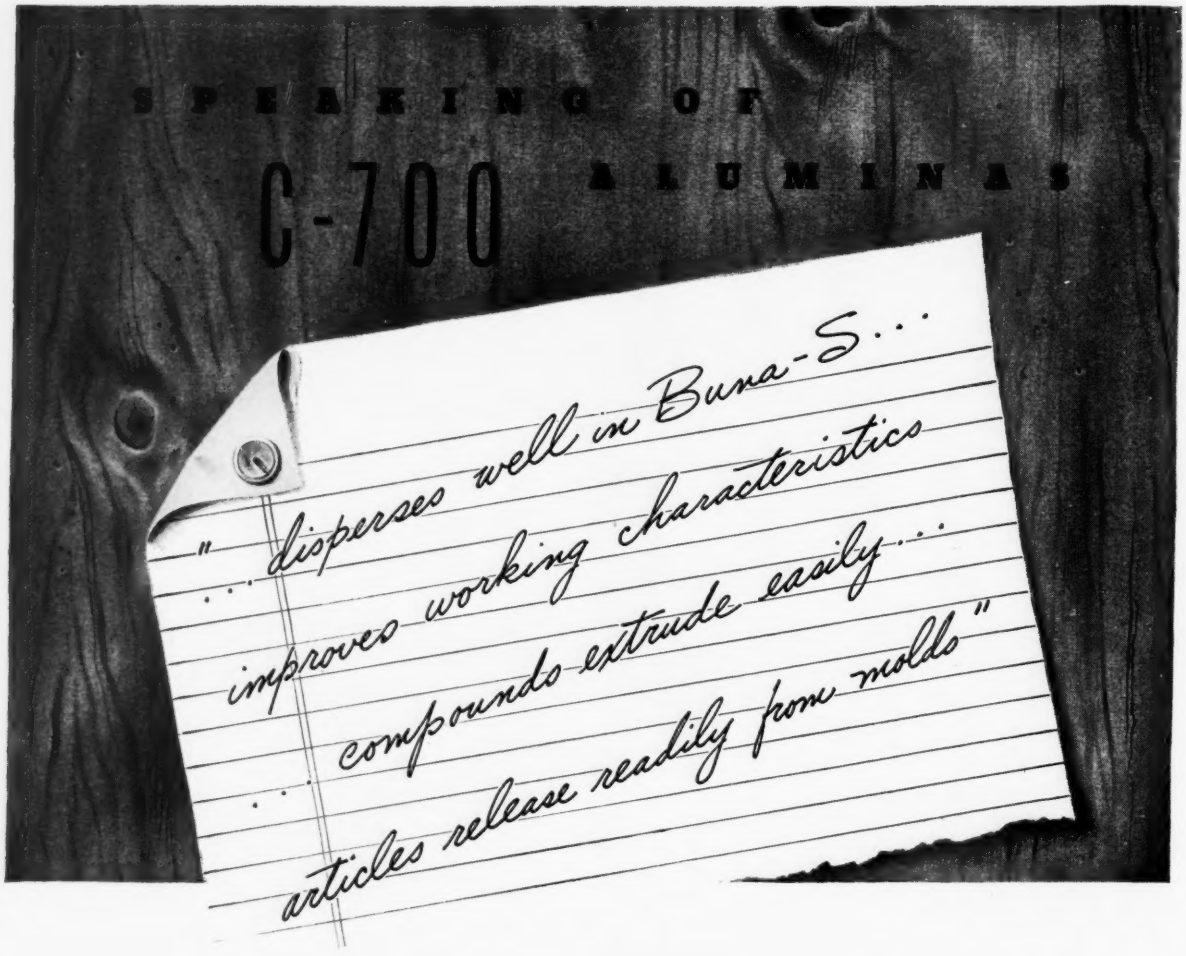
Chemically and physically Controlled

SHELL

SHELL OIL COMPANY, INC.

50 WEST 50th STREET

NEW YORK 20, N. Y.



Reports on the use of C-700 Aluminas with synthetics, like that quoted above from compounder's statements, give promise of an extremely useful future. Because of the newness of the synthetic rubber industry, less is known of the requirements for fillers there. But we're learning.

Uniform fineness — To this property of C-700 Aluminas rubber compounders assign considerable credit. It helps account for the superior performance obtained when these reinforcing pigments are used with natural rubber, the greater volume of finished product from a fixed amount of crude, the easier manipulation of stock.

To manufacturers who are wondering about means of improving rubber products, we offer every facility at our command. For samples of C-700 Aluminas to test in your processes, write ALUMINUM COMPANY OF AMERICA *(Sales Agent for* ALUMINUM ORE CO.,) 1909 Gulf Bldg., Pittsburgh 19, Pa.

ALUMINUM ORE COMPANY

ALORCO

Aluminum and Fluorine Compounds

It pays to be adaptable!

After the war, Crown Zipper engineers will adapt—or if necessary, *create*—special applications to meet special needs!

A lot of old-fashioned notions were exploded when Crown Zipper engineers went into the field with our armed forces to adapt zippers to military jobs.

Crown engineers proved that zippers can be big and tough yet easy to operate, small and dainty yet virtually indestructible!

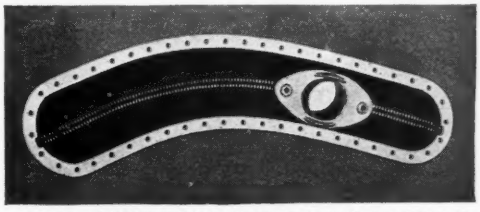
They proved zippers can be made that actually slide freely around sharpest curves!

They proved two or more sliders can be put on the *same* zipper track—to provide openings at any given point with smooth closures in both directions!

In fact, they made more big, important improvements in zipper design than anyone dreamed possible. (See complete list of Crown superiorities below.)

But perhaps the most important thing they proved is that zipper designs don't *have* to be "frozen"—zippers can be *adapted* to the *job!*

When *you* turn to postwar, Crown engineers will be able to show you exactly what this means in terms of longer zipper life and easier operation in rubber goods applications. Crown engineers will adapt—or, if necessary, *create*—special Crown Zippers to meet your own individual manufacturing problems!



"DOUBLE-ACTING" CROWN ZIPPER ON AIRCRAFT GUN TURRET OPENS AHEAD OF GUN OPENING, CLOSES BEHIND IT.

CROWN ZIPPERS are 5 ways better

1. Takes sharp curves

2. Die-cast for smoother action—extra strength

3. Provides opening wherever you want it

4. Won't lock open

5. Resists corrosion

Member of the J. & P. Coats • Clark's ONT *Family*

THE SPOOL COTTON COMPANY • *745 Fifth Avenue, New York, N. Y. (Crown Fastener Division)*

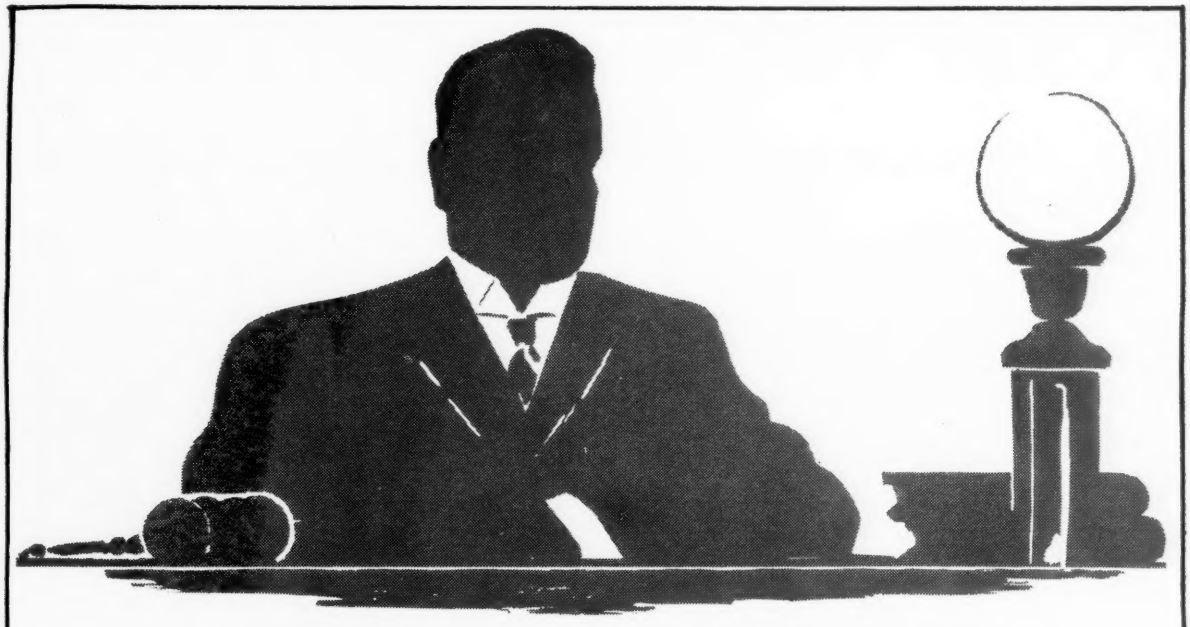
The Obligation of a Name

Adherence to long established, sound principles, in dealing with its customers has built a desirable, nation-wide reputation for the St. Joseph Lead Company. Its years of experience in the production of lead-free zinc oxides of consistent high quality has resulted in a spirit of responsibility among the members of this organization. This assumes tangible form in the manner by which a great tradition continues to be transformed into quality products.

ST. JOSEPH LEAD COMPANY

250 PARK AVE., NEW YORK, 17, N. Y.

MADE BY THE LARGEST PRODUCER OF LEAD IN THE UNITED STATES



RESINEX

. . . It Stands the Most Critical Judgment . . .

RESINEX has been on trial in many plants only to repeat the proof of greater value through the critical tests of finished products . . . This thermoplastic Extender-Plasticizer is helping an increasing number of manufacturers get better product performance with reduced production cost. These test facts show why —

- **Smoother Extrusion**
- **Greater Tensile**
- **Greater Elongation**
- **Resistance to Oil and Grease**
- **Greater Reduction of Flex-Cracking**
- **Greater Resistance to Tear**
- **Greater Resistance to Abrasion**

Write for Laboratory Facts and samples

STANDARD *Chemical Company*

General Offices: AKRON 8, OHIO

PELLETEX Helps Our Forces Surmount Many Obstacles

U. S. Signal Corps Photo

Rafts of synthetic rubber for ferrying troops and light equipment across rivers are playing a vital role in the march to Victory. Technicians find PELLETEX Semi-Reinforcing Furnace Black an ideal pigment for this type of service. Its remarkable uniformity and easy processing help to insure quality and dependability in the finished product.

In service as in laboratory tests PELLETEX and GASTEX have repeatedly topped all blacks for certain specific purposes. Consult our technicians. No priorities required on their services.

HERRON BROS. & MEYER

OHIO BLDG., AKRON, OHIO.

GENERAL SALES AGENTS FOR

GENERAL ATLAS CARBON

GASTEX TRADE MARK

PELLETEX TRADE MARK

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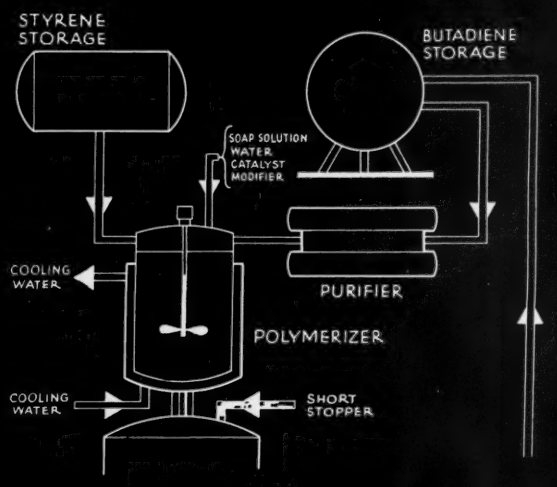
PROBLEM: To remove heat from polymerization reaction batch of GR-S



SOLUTION: Circulate chilled water through jacket of polymerization tanks

Complete temperature control in every step of the manufacturing process is essential to the production of uniform batches of GR-S.

In polymerization, for example, if the reaction batch is allowed to heat above a certain temperature the resulting product may fail to meet rigid government specifications for GR-S, (synthetic rubber).

Yet—the reaction of butadiene and styrene generates heat—and the progress of polymerization would quickly take a wrong turn if the heat were not removed.

At the B. F. Goodrich plant in Port Neches, Texas, heat is removed from the polymerization reaction batches by chilled water, circulated through the jackets of the polymerization tanks. Chilling of the water is accomplished with two Carrier Centrifugal machines, with a total refrigerating capacity equal to the melting of 1275 tons of ice daily.

The Carrier Centrifugals used by B. F. Goodrich in this operation were "drafted" for their job. One was the heart of the air conditioning system of the Washington, D. C., store of Sears, Roebuck & Company; the other was obtained from the Famous-Barr Department Store, St. Louis, Missouri.

Many other great American stores have made similar contributions to America's war effort . . . have voluntarily relinquished their Carrier Centrifugal machines to speed production of synthetic rubber, vital to victory. These compact, space-saving machines produce the uniformly controlled low temperatures upon which the production of GR-S depends—operate at uniformly low cost.

If you are engaged in the production of synthetic rubber, or are making plans for post-war production, write now for more information about the Carrier Centrifugal Refrigeration machines—make full use of Carrier's 22 years of continuous experience in designing and building air conditioning and refrigeration equipment for the rubber industry.

•

CARRIER CORPORATION, Syracuse 1, N. Y.

Carrier

ARMY E NAVY

AIR CONDITIONING • REFRIGERATION

FORTY-TWO YEARS EXPERIENCE IN INDUSTRIAL INSTALLATIONS

SILICAL

(NEWFOUNDLAND PYROPHYLLITE)

A REINFORCING FILLER FOR USE IN WIRE INSULATION COMPOUNDS

EASY PROCESSING
LOW WATER ABSORPTION
MICA FREE
GOOD ELECTRICAL PROPERTIES
HIGH MODULUS
LOW PERMANENT SET
READILY AVAILABLE

✦

SAMPLES AND TECHNICAL DATA AVAILABLE

HERRON BROS. & MEYER

82 Beaver Street, NEW YORK 5, N. Y.

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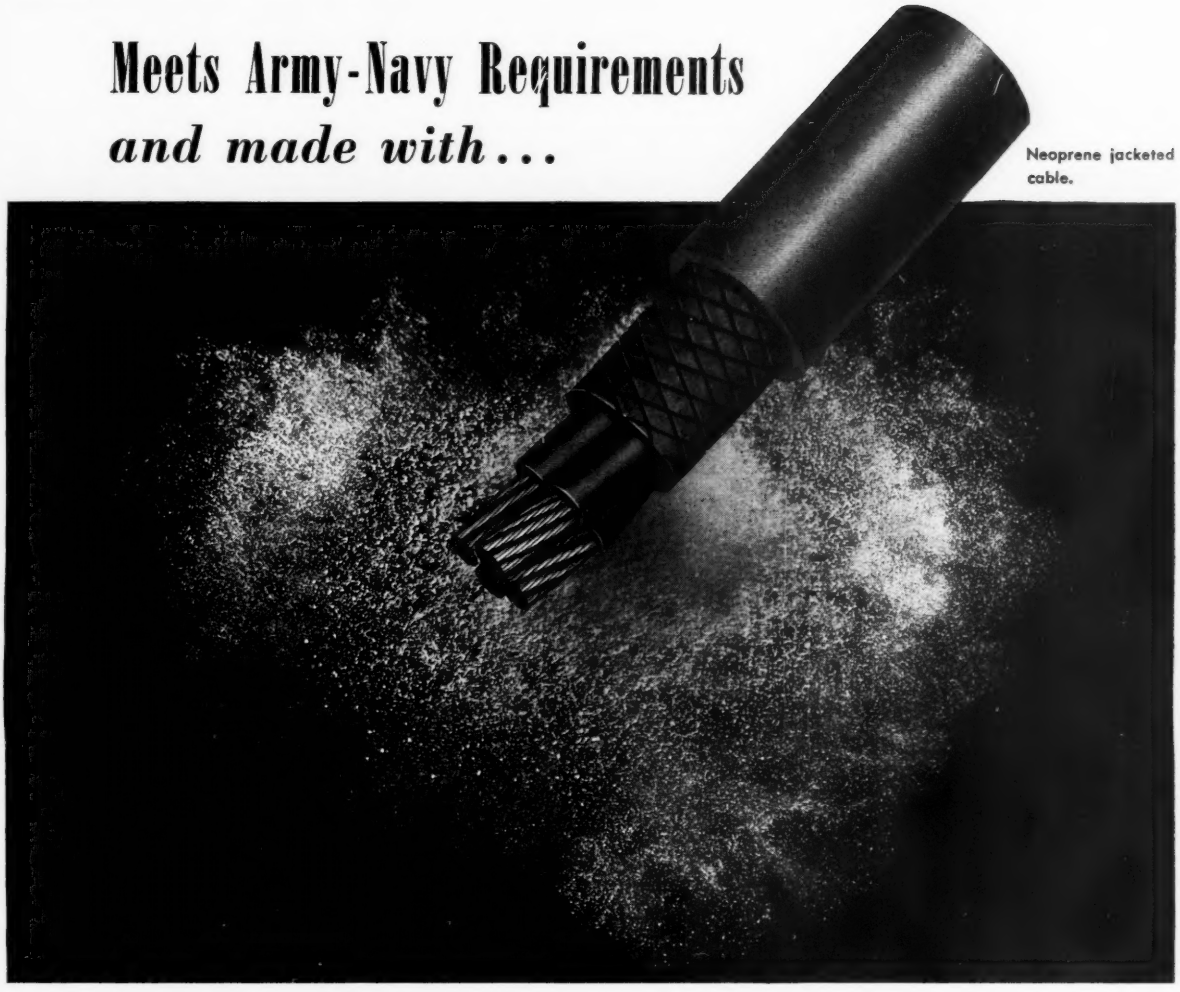

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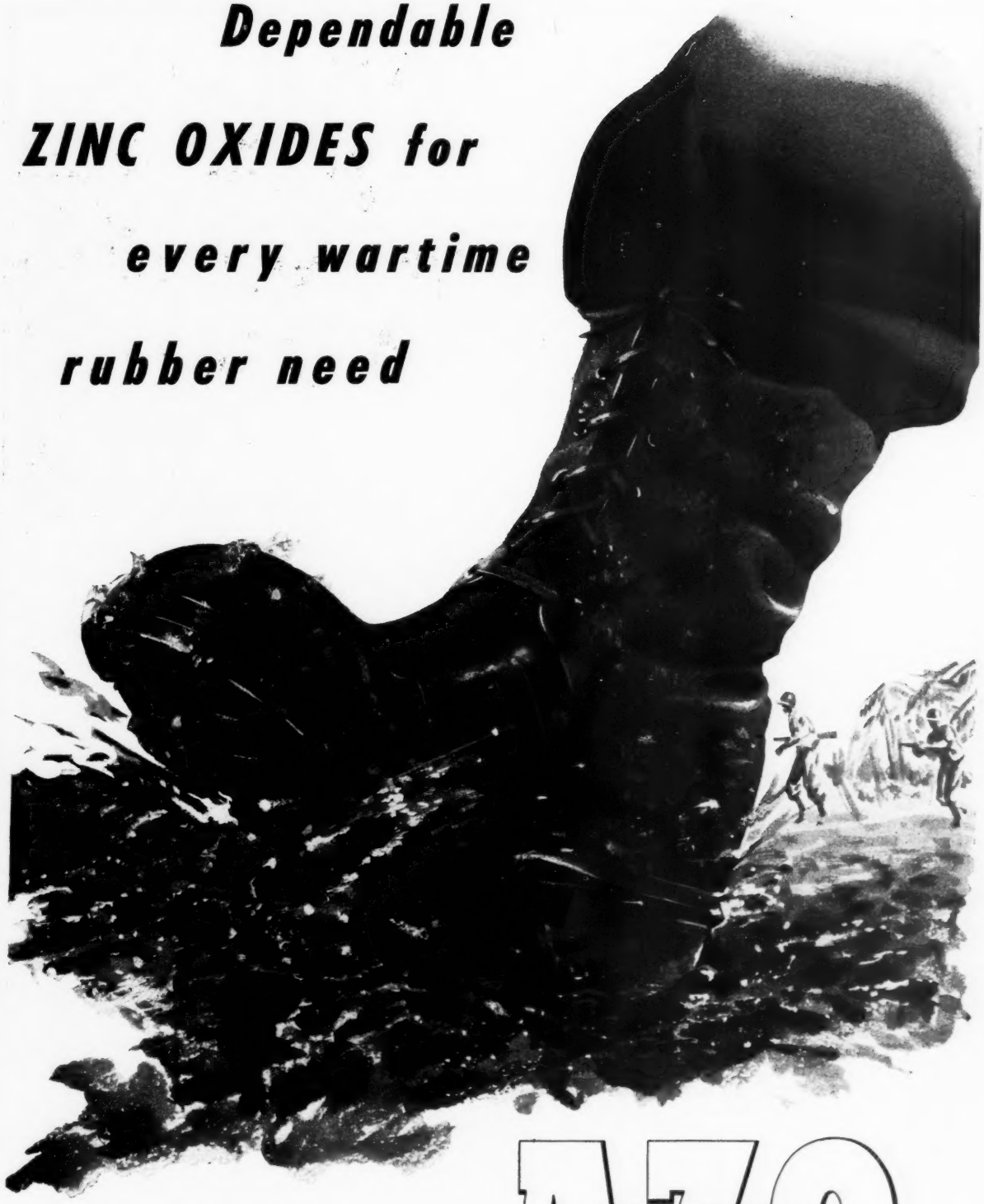

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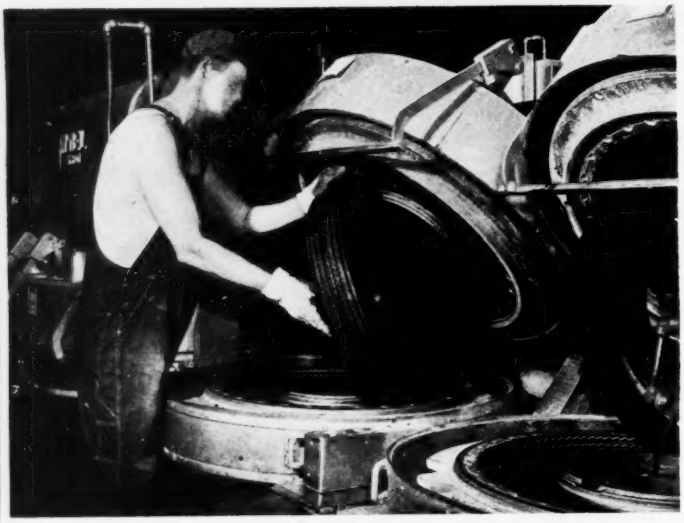

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Volume 110 **New York, August, 1944** **Number 5**

The Effect of Temperature on the Vibration Characteristics of Natural and Synthetic Rubbers[1]

J. D. Morron,[2] R. C. Knapp,[2] E. F. Linhorst,[2] and P. Viohl[2]

FOR a good many years we have considered the climate as something not too important in connection with rubber compounds. We have used rubber as a rule without any temperature qualifications as far as the lower range of temperatures was concerned and have had very little real trouble. In the past three years, however, the situation has radically changed. For some time now a much larger part of our goods is being exposed to low temperatures because of the great development of the use of the airplane during the present war and the need of its use at high elevations where extreme cold exists and in temperatures such as those found in the Aleutians and Alaska.

In addition our difficulties have been aggravated by the necessity of converting from natural to synthetic rubber in the manufacture of almost all rubber products. Natural rubber has been so satisfactory at low temperatures that as a rule very little consideration has been paid to the low temperature requirements of materials compounded from it, except in very few specific instances. Now the industry has suddenly been forced to become cold conscious, and the first thing that has occurred to everybody, is that both natural and synthetic rubber to a greater or lesser extent, at very low temperatures become brittle and break under sudden bending or shock. As a result, tests have been standardized on this basis, and these are the tests which have become common in the literature and upon which the performance of our natural and synthetic rubber compounds are judged. Such tests, while probably satisfactory for a piece of hose or some other item whose only mechanical service is occasional bending or flexing, are not at all adequate when we come to the subject of vibration insulators or such a specific branch as mountings for engines, machinery, and other purposes. The main function of such insulators or mountings is to reduce the transmission of vibration, and if they do not do this job, regardless of whether the mounting itself is easily destroyed by shock blow or not, they have lost all their ability to act as a vibration insulator and have therefore become valueless.

Compounds Used

In studying the effect of temperature and especially subnormal temperatures on the vibration characteristics of various rubbers, the recipes which we have chosen for comparison were not selected on the basis of comparative test data, but instead were practical factory formulae made up for substitution purposes. Therefore the compounding of each recipe may differ considerably since in each case factory processing and many other factors had to be considered besides the particular properties which are discussed in this paper. For that reason a number of inconsistencies are apparent in the data, and it should be realized that the properties of the various synthetics can be modified to a considerable extent by changes in compounding so as to accentuate any particular property. However the general conclusions drawn in connection with the main object of this paper, which is to demonstrate a new method of evaluating those properties of various elastomers that directly affect their ability to serve as vibration insulators, are to the best of our knowledge valid.

Some idea of the general quality of the stocks chosen for this work may be obtained from an examination of the physical test results given in Tables 1 and 2.

TABLE 1. PHYSICAL PROPERTIES OF 40 DUROMETER STOCKS

Stock	Tensile P. S. I.	% Elongation	300% Modulus	Compression Set (B)	Torsional Hysteresis (285° F.)
Natural Rubber ..	3230	750	180	13.6	.047
GR-S	1550	700	360	25.0	.102
GR-M	3000	970	280	30.0	.076
GR-I	1850	700	600	17.6	.091
Perbunan	1730	790	445	23.5	.094

[1] Paper presented before the Canadian Chemical Conference, Toronto, Ont., June 6, under the title "The Properties of Synthetic Rubber and Their Effect on Vibration Characteristics."

[2] Motor products development department, United States Rubber Co., Detroit, Mich.

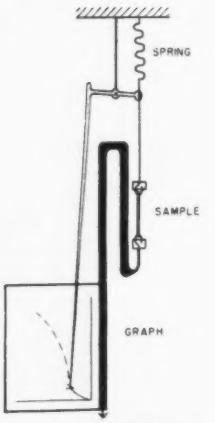

Fig. 1. Diagram of Recording Stress - Strain Apparatus

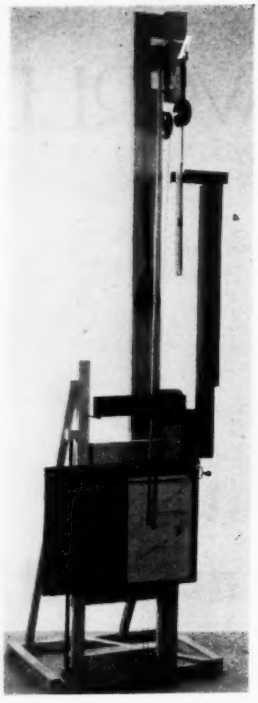

Fig. 2. Recording Stress-Strain Tensiometer

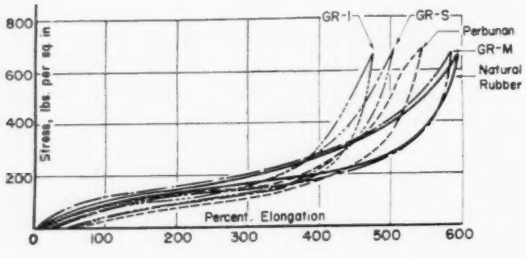

Fig. 3. Stress-Strain Characteristics of 40 Durometer Stocks of Various Elastomers at Room Temperature

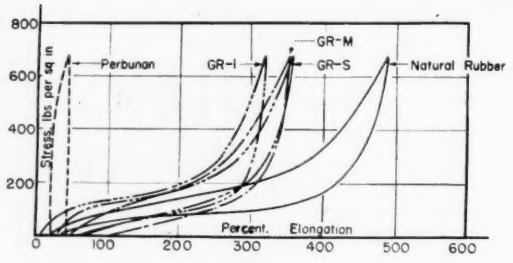

Fig. 4. Stress-Strain Characteristics of 40 Durometer Stocks of Various Elastomers at 0° F.

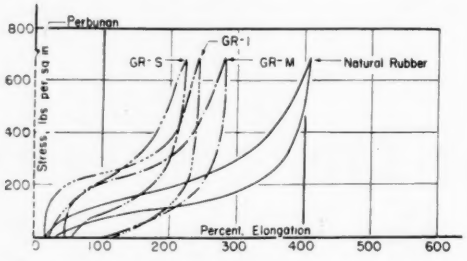

Fig. 5. Stress-Strain Characteristics of 40 Durometer Stocks of Various Elastomers at –25° F.

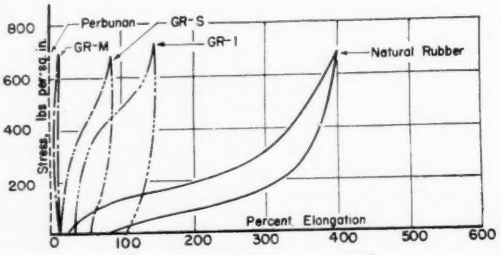

Fig. 6. Stress-Strain Characteristics of 40 Durometer Stocks of Various Elastomers at –40° F.

TABLE 2. PHYSICAL PROPERTIES OF 60 DUROMETER STOCKS

Stock	Tensile P. S. I.	% Elongation	300% Modulus	Compression Set (B)	Torsional Hysteresis (285° F.)
Natural Rubber ..	3150	650	775	17.7	.107
GR-S	1950	425	1415	18.9	.077
GR-M	2150	630	880	40.0	.118
GR-I	1700	430	1440	13.0	.105
Perbunan	2000	460	1210	19.5	.101

Brittle Point Values

The conventional method of judging the above stocks for cold resistance resulted in the values listed in Table 3. The method of Selker, Winspear, and Kemp,[3] of Bell Telephone Laboratories, was used for these determinations.

TABLE 3. BELL TELEPHONE BRITTLE POINT

Stock	Brittle Point, ° F. (40 Durometer Stocks)	Brittle Point, ° F. (60 Durometer Stocks)
Natural Rubber	–60	–60
GR-M	–37	–36
GR-S	–61	–61
GR-I	–51	–43
Perbunan	–6	–50

It will be noted from this table of brittle point values that GR-S is fully equivalent to rubber, that GR-I is better than GR-M, and that both of these rubbers are satisfactory at temperatures below 30° F. Perbunan differs widely from the other rubbers, depending upon the type of plasticizers used with it, and it should be noticed that the 60 durometer Perbunan stock, which contains a good freeze-resistant plasticizer, shows a brittle point of –50° F. It should be remembered in this connection that brittle points can be varied considerably by compounding, but that they are also essentially affected by the polymer used.

Stress-Strain Curves at Various Temperatures

Our first attempt to obtain some insight on the properties of the synthetic rubbers at various temperatures was to build a stress-strain tester with autographic features which could be easily used for the purpose of preparing stress term curves for any temperature. This machine was designed by E. F. Linhorst and has a number of features which are of particular interest.

The machine is based on the principle of movement magnification with a lever of large arm ratio. As seen in the diagram (Figure 1), a T-50 test piece one inch long is attached by one end to a rigid member carrying a chart, and as this is moved downward, the rubber is stretched. The other end of the rubber is attached to a stiff spring which has a deflection of 0.03-inch per pound of pull. This small deflection is magnified by a right-angle lever of arm ratio of about 32 to 1 and recorded horizontally with pen and ink. The graph has nearly rectangular coordinates, and one inch of movement of the pen hori-

[3] *Ind. Eng. Chem.*, 34, 137 (1942).

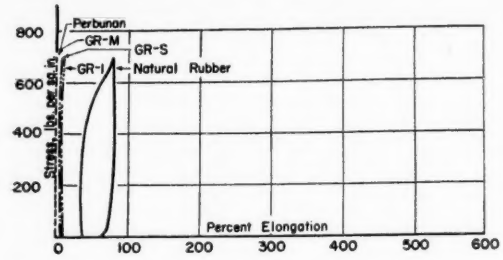

Fig. 7. Stress-Strain Characteristics of 40 Durometer Stocks of Various Elastomers at –60° F.

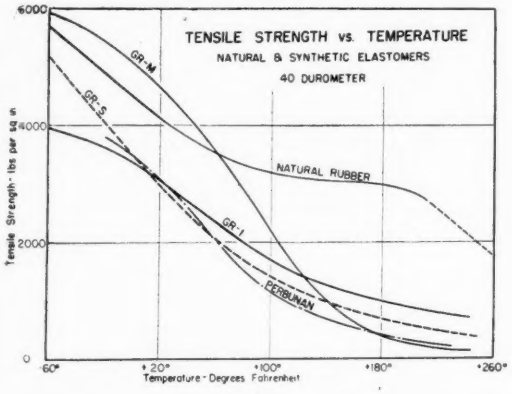

Fig. 10. Tensile Strengths at Different Temperatures of 40 Durometer Stocks of Various Elastomers

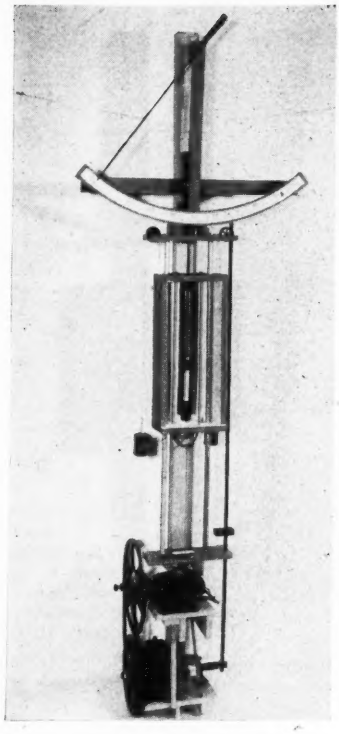

Fig. 8. Machine to Determine Tensile Strength over a Range of Temperatures

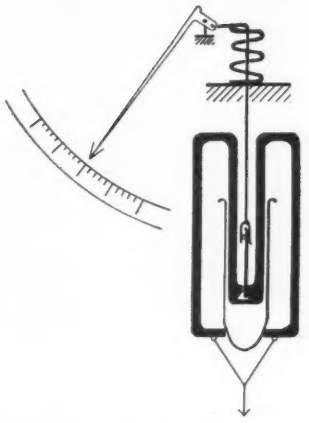

Fig. 9. Diagram of Variable Temperature Tensile Strength Tester

zontally represents about one pound of pull. The movement of the chart is effected by a crank, cord, and pulley arrangement. Tests at lower temperatures can be made by immersing the sample into a Dewar flask containing alcohol cooled with dry ice. For higher temperatures hot ethylene glycol can be used.

The machine pictured in Figure 2 was built of simple materials—wood and few metal parts—and, while apparently crude in appearance, actually gives perfectly satisfactory readings within the experimental limit of accuracy. The most ingenious thing about this machine is the method of cooling or, if the occasion demands it, heating the samples. The whole arm holder test piece can be inserted either in a Dewar flask for cooling or in a flask with liquid kept at boiling temperature, for heating. The simplicity of the attachment and the ease with which it allows the use of a cooling solution of alcohol or dry ice have made it possible to obtain a great deal of interesting data.

The results obtained with this apparatus can be shown in a series of curves. For sake of simplicity, representative curves of 40 durometer natural and synthetic rubber stocks have been selected for discussion. Stress-strain curves at room temperature (Figure 3) of all the synthetics show a reasonable resemblance to natural rubber. At 0° F. (Figure 4) the spread between the different synthetics has already become very marked. Natural rubber has been very little affected. GR-S and GR-M are still elastic; GR-I and Perbunan, which has not been compounded for cold resistance, are rapidly becoming stiff.

At –25° F. (Figure 5) natural rubber is still elastic; GR-M and GR-S are showing a decided stiffening; GR-I is also stiff, and Perbunan has lost all flexibility. The temperature of –40° F. is the critical point referred to in most specifications. Natural rubber (Figure 6) is still elastic; GR-M has become very stiff along with Perbunan; while GR-S and GR-I are still slightly flexible. At –60° F. (Figure 7) natural rubber has stiffened up to a very great degree, but still retains some flexibility. All of the synthetics have become hard and lost all flexibility.

It should be noted particularly that a comparison of the stress-strain curves with the brittle point figures shows that the picture presented by the stress-strain curves is considerably different from the picture presented by the brittle point determinations. The information obtained from these curves serves as a warning that the properties of the synthetics vary much more widely under changing temperature conditions than previous data had revealed.

Tensile Tests at Varying Temperatures

Some other data of interest may be the tensile strength of various synthetic rubbers at different temperatures, and for this we have again built a tensile testing machine incorporating a test piece holder which can easily be immersed into a glass flask. This machine, shown in Figure 8, obtains tensile strength values in a manner similar to the Scott machine, but is so designed that the tests may be made at different temperatures. As may be seen from the diagram (Figure 9), one end of the usual dumbbell test piece is attached to a force measuring device, while the other end is stretched by a motor and speed reducing mechanism at a rate of 20 inches per minute. For temperatures down to –50° C. the sample is immersed into a large test tube 17 inches long, filled with alcohol and cooled with dry ice. The test tube can be insulated with cellophane. For temperatures below –50° C. a Dewar flask can be used. For testing at high temperatures, the test tube is filled with heated ethylene glycol. The force measuring device is similar to that of the tensiometer, but is not self-recording.

The tensile strength of natural and the various synthetic rubbers over a range of temperatures from +260° F. to –60° F. is shown in Figure 10. As may be seen from these curves, natural rubber is much stronger at elevated temperatures than any of the synthetics, and it is only sur-

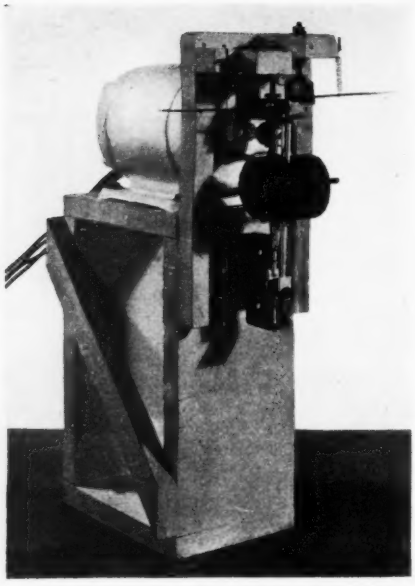

Fig. 11. The Shear Resiliometer

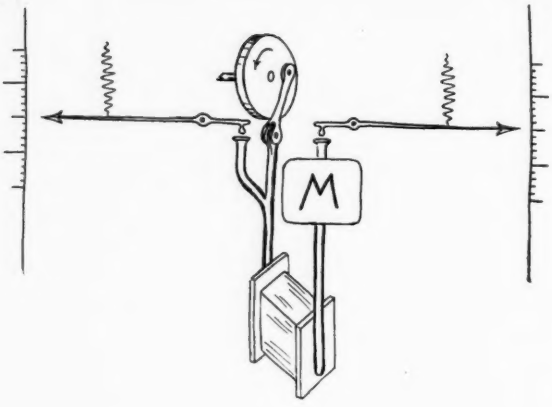

Fig. 12. Schematic Drawing of Shear Resiliometer

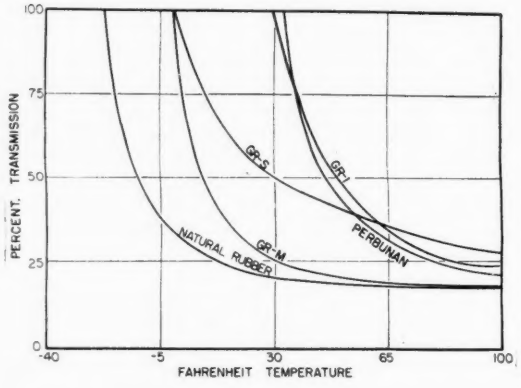

Fig. 13. % Transmission of Vibration of 40 Durometer Stocks of Various Elastomers at Different Temperatures

passed at lower temperatures by GR-M. At the higher temperatures GR-M has the least strength of all the rubbers, but at about room temperature it becomes equal to natural rubber, which is in accordance with general observations. Other synthetics are lower than natural rubber, with GR-I the best at high temperatures and with GR-S following the natural rubber curve quite closely, although lower at all points.

Measurement of Vibration Transmission

While all of these data are of considerable interest, however, we still did not have any direct positive evidence of the actual effect of different synthetics at varying temperatures on the transmission of vibration. Mr. Linhorst again designed and built what we call a sheer resiliometer by which it is possible actually to measure the amount of vibration transmitted through a mounting under varying temperature conditions by measuring the applied amplitude of vibration compared with the transmitted amplitude of vibration. This device simulates the conditions that exist when a delicate instrument such as a radio is attached to the vibrating frame of an airplane or motor car by means of rubber mountings. This machine is illustrated in Figure 11, and a diagram showing the principles involved in its operation is found in Figure 12.

One side of the mounting is forcibly vibrated by a constant speed (1800 r. p. m.) motor with an eccentric pin on the end of the shaft. The other side of the mounting carrying the load receives whatever fraction of the applied vibration is transmitted by the mounting. The amplitudes of the vibrations, 0.015-inch or less, are too small to be seen directly, and they are therefore magnified ten times by a light weight lever six inches long made of thin metal of right angular cross-section. The ratio between the transmitted and applied amplitudes is called the vibrational transmissibility. Tests can be made at temperatures either above or below that of the room by the use of alcohol cooled with dry ice or heated glycol.

With this instrument it was possible to determine the amount of vibration transmitted over a range of temperatures and from the results obtained prepare a comparative chart showing the relative efficiency of the different synthetics and natural rubber at various temperatures. The variation with temperature of the vibration transmitted by the different rubbers as 40 durometer stocks, expressed as "% transmission" is given in Figure 13. Natural rubber and GR-M are practically equivalent at room temperature; while at 10° F. natural rubber is still as good as GR-M at 30° F. At –5° F. natural rubber, although it has started to lose its ability to absorb vibration, still has some merit; while GR-M has completely lost any ability to absorb vibration. GR-S at room temperature is not so good as natural rubber, but as the temperature drops, it does not lose its ability to absorb vibration so rapidly as GR-M. Both GR-M and GR-S ultimately are definitely inferior to natural rubber. GR-I and Perbunan, if the latter has not been compounded for freeze resistance, show a rapid loss of their ability to absorb vibration because of their characteristics of stiffening quickly with comparatively small reductions of temperature below 75° F.

With the 60 durometer stocks the picture, as shown in Figure 14, is nearly the same except that with the higher durometer stock to start with, slightly less resistance to cooling is shown. The natural rubber stocks still show great superiority. One interesting difference is that the 60 durometer Perbunan stock now shows relatively better ability to absorb vibration, which can be explained by the fact that this stock was specially compounded with freeze-resisting plasticizer.

Effect of Initial Deflection on Vibration Transmission. It should be kept in mind that the amount of vibration transmitted by any particular stock depends not only upon the stock being used and the temperature at which it is being tested, but also upon the initial deflection of the sample. The importance of this can well be illustrated by Figure 15, which shows the variation in per cent. vibration transmission depending upon the initial deflection. It will be noted that as the loading is increased, the

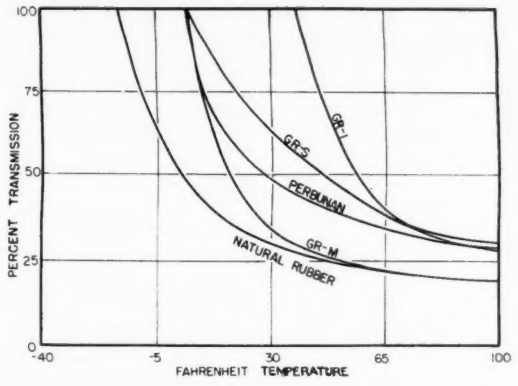

Fig. 14. % Transmission of Vibration of 60 Durometer Stocks of Various Elastomers at Different Temperatures

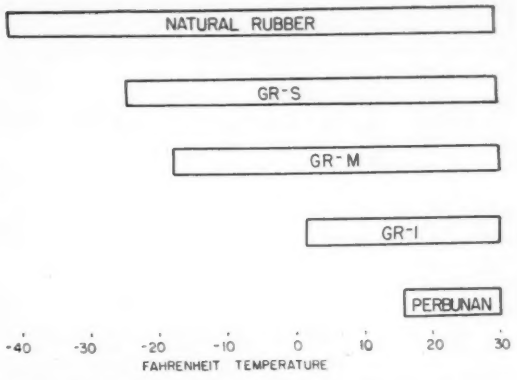

Fig. 16. Barrier Point Values of Various Elastomers in the Shear Resiliometer

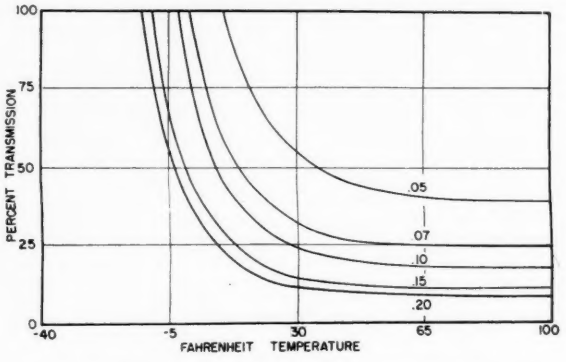

Fig. 15. Effect of Varied Load Deflection on % Transmission of Vibration for 40 Durometer GR-M Stock

performance is improved. From this point can be drawn the conclusion that if the bond and elastomer are sufficient to resist greater strain, then the designs which have high initial deflection will be the most successful at low temperatures.

Barrier Points of Various Rubbers. It is a common belief among many people that the problem of freeze resistance in mountings is not too serious because the mountings will warm up when they are vibrated. We have found, however, that in any given system there is a definite temperature below which a mounting will not warm up, no matter how long it is vibrated. This temperature will depend upon a number of factors: the stock itself, the shape of the mounting, the initial deflection, the radiation and conduction permissible in the system, and the frequency and amplitude of the vibration. We call this critical temperature the barrier point, and Figure 16 illustrates barrier points for the shear resiliometer system itself, using 40 durometer stocks of various elastomers in dry ice and alcohol mixtures. Note that natural rubber under such conditions will warm up at temperatures just above –40° F. Other elastomers, as shown, have a higher barrier point and thus will become ineffective at a much warmer temperature than natural rubber. Unquestionably this ability of the mounting to warm up when vibrated is an extremely important factor in making mountings that will be practically serviceable at temperatures where static tests would indicate complete failure.

Summary and Conclusions

The results of this work have been to show that the effect of temperature on the functions of vibration insulators is much greater than would be supposed from the type of tests which have become more or less common in the industry for determining the effect of low temperatures on various elastomers. It has also shown that natural rubber is the outstanding material for vibration insulation at subnormal temperatures. The substitution of any of the synthetics for natural rubber is a problem which requires not only a thorough study of compounding, but also of the practical conditions under which the particular mounting or insulator is supposed to function. An improvement in vibration insulation over a wide range of temperatures may be obtained by means of increased initial deflection. A critical point, called the "barrier point," which is dependent not only upon the compound, but upon the design and application of the mounting is defined.

New laboratory methods have been devised to obtain information which our design engineers can apply to practical problems. This equipment actually shows the percentage of transmission of vibration. New equipment for the determination of stress-strain curves and tensile tests at all temperatures are likewise described and their uses explained.

We hope that the simple, yet accurate instruments which have been devised from commonly available materials will be of some encouragement to others who wish to investigate the properties of different elastomers over a range of temperatures, but are hampered by the limitations of priorities, expense, and the fact that there is a lack of suitable equipment on the market for such investigations.

Carbon Black Sales Increase in 1943

Sales of carbon blacks in 1943, according to the Bureau of Mines, United States Department of Inerior, reached 629,300,000 pounds including exports, compared with 449,931,000 pounds in 1942. Shipments to rubber manufacturers set a new record of 473,473,000 pounds contrasted with 295,947,000 pounds in 1942 and the previous peak of 439,502,000 in 1941. Expansion of synthetic rubber manufacture was reflected in the production of furnace blacks which increased 47% over the 1942 record. They comprised 36% of the total production of carbon black in 1943, compared with 25% in 1942 and 17% in 1941. Seven new furnace-type plants were put into operation during 1943, and three channel plants were shut down. Producers stocks totaled 205,215,000 pounds at the end of 1943, a 15% decline from the amount on hand at the close of 1942. Total production was 3% above 1942.

The Government Pilot Plant and Evaluation Laboratory at Akron

R. G. Seaman

Firestone Tire & Rubber Co.

Fig. 1. The Government Synthetic Rubber Pilot Plant Building at Akron, O.

Akron Beacon Journal

Fig. 2. The Government Evaluation Laboratory at Akron

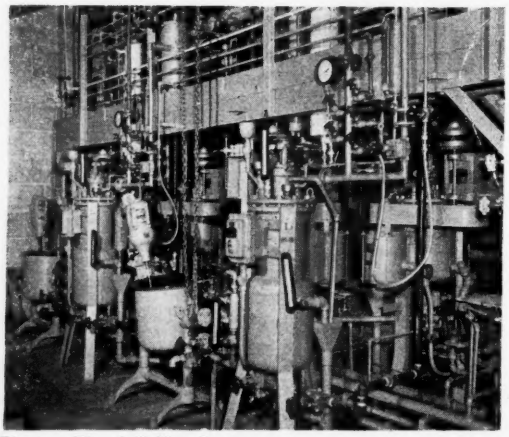

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Fig. 3. A View of Two of the Five-Gallon Reactors Showing the Coagulating Pots, Piping, Gages, and Other Accessory Equipment

THE government-owned pilot plant and evaluation laboratory at Akron, O., mentioned in Progress Report No. 5 by Rubber Director Bradley Dewey was opened for inspection by the press and public on June 28. At the brief dedication ceremonies which preceded the inspection the Rubber Director stated in explaining the purpose of this government-sponsored project that the nation's scientists are determined to produce a better synthetic rubber "than any tree ever produced." The pilot plant and laboratory are being operated by the University of Akron under a contract arrangement. A view of the pilot plant building is shown in Figure 1, and a view of the evaluation laboratory in Figure 2.

Equipment in Pilot Plant Extensive

The pilot plant contains an impressive array of equipment centered around polymerization reactor tanks of capacities from five to 500 gallons and includes weighing, pumping, purifying, recovery, blending, and testing equipment so that practically all conceivable factors involved in the production of synthetic rubbers may be varied at will. The pilot plant building may be thought of as divided into three main areas: one comprising the offices, laboratory, and machine shop; the second containing the five-gallon reactor equipment; and the third and largest area which houses the 80- and 500-gallon reactors and accessory equipment. This last area is of necessity further divided into a bottom, middle, and top floor level.

THE 80- AND 500-GALLON REACTOR AREA. On the ground floor or bottom level of the 80- and 500-gallon reactor area, in addition to the bottoms of the reactor tanks, there also may be seen the pumps and piping for the heat transfer system for these reactors. This system, of standard plant design, provides water for cooling and steam for heating the tanks and also includes the necessary flowmeters and temperature measuring devices for obtaining data for thermodynamic calculations. Two 250-gallon and two 1,500-gallon glass lined "stripper" tanks connected by pipes to foam traps and condensers on the top level of this area are also located on the ground floor. These "stripper" tanks receive the synthetic rubber latex from the reactors upon completion of the polymerization reaction, and in the accompanying equipment the unreacted monomers are removed before the latex is transferred to the blending and coagulation tanks. Also on this level is a standard design, three-tank, salt-acid set-up for coagulating the rubber latex. Modification of the coagulating procedure may be arranged for in this set-up or in either of two additional batch tanks, one for the 80- and the other for the 500-gallon reactors, in which different types of coagulation of individual batches may be carried out. The necessary washing and screening equipment for the coagulated synthetic rubber is also found here, but the drying ovens and baling presses are housed in a separate building. Apparatus for purification of the water used in the reaction batches by means of the resin ion-exchange method is installed on this floor.

The middle or second floor level of the large reactor area contains the tops of the two 80- and two 500-gallon reactor tanks. Special chambers on the tops of these tanks are for adding various ingredients to the reaction batch against internal pressure. It should be mentioned here that although the two 80-gallon reactors are glass lined, only one of the 500-gallon reactors is glass lined; while the other is made of stainless steel for high-pressure study. There is one wooden and one steel latex blending tank, each of 1,000 gallons capacity on this floor, and other equipment includes soap make-up tanks, antioxidant make-up tanks, tanks for making up coagulating solutions, tanks for making up miscellaneous other chemicals, as well as a Charlotte colloid mill.

The top of the third floor of this area has a 300-gallon tank, constructed to withstand an internal pressure of 150 p.s.i. for caustic washing and equipped with a tower for the

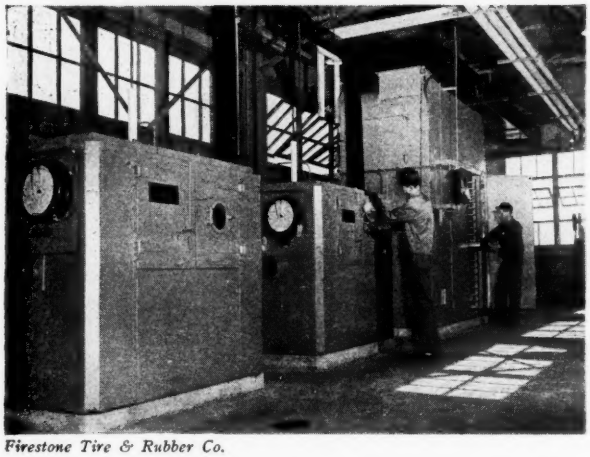

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Fig. 4. Interior of the Drier House; the Two Small Tray Driers Are in the Foreground, and the Large Drier for the 80- and 500-Gallon Reactors Is in the Background

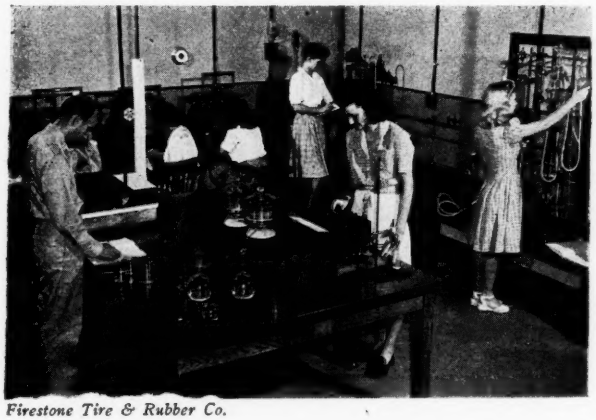

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Fig. 5. A Part of the Pilot Plant Control Laboratory

distillation of butadiene, as an additional or alternate method for the purification of this monomer. Butadiene and styrene or other monomer weighing tanks and pumps are on this level together with the fatty acid melt tank for soap preparation. This latter tank is piped to the second floor level soap make-up tank mentioned previously.

THE FIVE-GALLON REACTOR AREA. The five-gallon reactor area which is on the ground floor of the pilot plant building and adjoining the first floor of the 80- and 500-gallon reactor area, has 14 five-gallon reactor units, and two additional special five-gallon reactor units are to be installed later. Each of the 14 units now in operation is made up of two five-gallon reactors and one stripping unit. See Figure 3. Butadiene and styrene, or other monomers, are measured into the reactor tank by volume, using gages mounted above these tanks. A pipe line carries nitrogen to each of these reactors for use in removing the air from the reactor tanks before the introduction of the butadiene. Agitators on these tanks operate in a range from 100 to 600 r.p.m. The synthetic rubber latices from these reactors are transferred into 15-gallon glass-lined pots for coagulation, and after washing, the synthetic rubber is deposited on screens for removal to the driers. An extra refrigerated water system is available in this area for use with any batches which may develop unusually high reaction rates during the polymerization reaction. Also available in this area are circulating fans which can provide a complete change of air in three minutes if necessary.

THE DRIER HOUSE. Drying ovens for both the five-gallon and the 80- and 500-gallon reactor areas are housed in a separate building convenient to the main pilot plant building. The three small tray driers, each with a capacity of 84 pounds on the dry basis, available for drying batches from the five-gallon reactors and a large tray drier of appropriate capacity available for drying batches from the larger reactors are shown in Figure 4. These driers can be adjusted to operate at any temperature between 150° and 250° F. Also installed in this building is a hand baler.

OFFICE, LABORATORY AND MACHINE SHOP AREA. The offices, locker, and washrooms for the chemists, engineers, and other personnel concerned with the operation of this pilot plant are situated to the right of the entrance of the pilot plant building as shown in Figure 1. Further along the corridor in this same location is situated a well-equipped laboratory for the necessary analyses involved in the control of the raw materials, processes, and finished products of the experimental batches of synthetic rubber being run in the pilot plant. Equipment in this laboratory includes gas analyzing apparatus, extraction apparatus, optical equipment such as microscopes and colorimeters, apparatus for

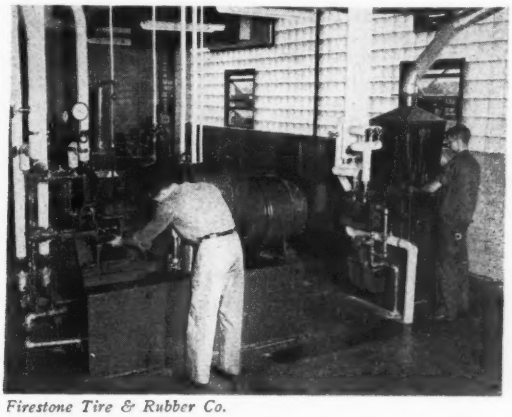

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Fig. 6. The Evaluation Laboratory Mill Room; Laboratory Banbury on the Left, and One of the Six- by 12-Inch Mills on the Right

determining viscosity and refractive index of monomers and other chemicals, titration apparatus, Podbielniak low temperature fractionating equipment for the analysis of butadiene, a Stedman column for the analysis of styrene, balances, a muffle furnace, and numerous other pieces of equipment. There is also installed in this laboratory one six- by 12-inch mill for the determination of volatile matter in the finished rubber and a Mooney plastometer. A part of this laboratory is shown in Figure 5.

On the other side of the corridor in this area are the machine shop and a storage room for some of the raw materials required in the experimental work. A double-door air lock chamber connects the office, laboratory, and machine shop area with the reactor areas. This is to prevent vapor leaks from the reactor area. Butadiene and styrene in the large volumes required for running batches in the 500- as well as in the five-gallon reactors is stored in a tank farm close to the pilot plant building.

The Evaluation Laboratory

The evaluation laboratory, which is situated next to the pilot plant as shown in Figure 2, is a two story L-shaped brick structure, 140 by 90 feet along its longest dimensions, in which glass brick is used for a very considerable part of the sidewalls to provide the maximum of daylight. Part

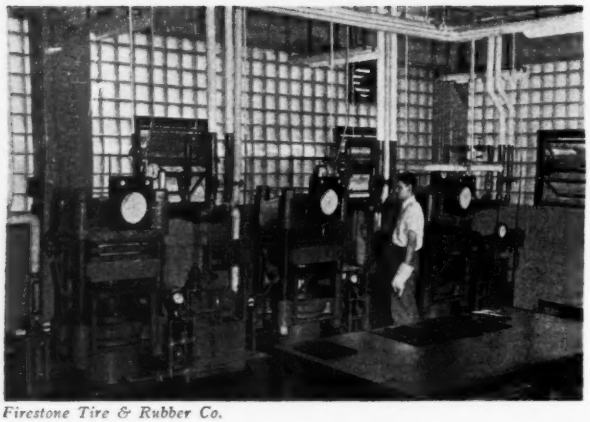

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Fig. 7. The Evaluation Laboratory Press Room Showing Three of the Three-Platen, 24-Inch Presses

of the building is air conditioned. The entrance on the ground floor front is into the reception room, and this room opens on to a corridor along one side of which are the locker and wash rooms and the service room containing the refrigerating and air conditioning equipment. On the other side of this corridor is a large room for receiving and storage of equipment and materials. At the end of this corridor a door opens into the laboratory mill room, and on either side of the mill room door are doors opening into the bin storage and weighing room for preparing the compound batches and into a sample room. A corridor to the left just before the entrances to the compounding and sample rooms leads to the press room and also to a first-aid room.

THE MILL AND PRESS ROOMS. Equipment in the mill room consists of three six by 12 mills, each provided for circulating water or steam or a mixture of both in the rolls, and one six by 12 mill which has the additional means for varying speeds of both the front and the back rolls over a range of five different r.p.m. Two 10- by 12-inch mills are also available, and a four-speed laboratory Banbury and a No. ½ Royle tuber with provision for circulating water at constant temperature at the extruding end are also installed in this room. The Banbury and one of the six- by 12-inch mills appear in Figure 6. Two Mooney plastometers are part of the equipment of the mill room. One of the plastometers uses steam for temperature control; while the other uses circulating oil and may be operated at temperatures up to 250° F.

The press room, which may be entered either from the mill or the corridor leading to the first-aid room, contains six three-platen presses each equipped with hydraulic pumps operating on oil to provide platen pressure from 500 to 2,000 p.s.i. The platens are 24 inches square, and pressure is delivered from a 16-inch ram. Three of these presses are shown in Figure 7. A.S.T.M. chromium-plated molds are used for vulcanizing the samples. A two- by three-foot tank with circulating water is used for cooling the samples after cure. Specially designed air-conditioned cabinets for storing the samples before testing are part of the equipment of this room.

On the second floor of the evaluation laboratory, the chemical and physical testing laboratories are above the mill and press rooms in the short leg of the L of this building; while on the left of the corridor along the long leg of the L are the aging room, conference room, rest rooms, and part of the office rooms for personnel of the Office of the Rubber Director. On the right of this corridor is the part of the office space occupied by the stenographic, accounting, and other personnel of the University of Akron, and further along are office rooms of the director of the laboratory and his assistants.

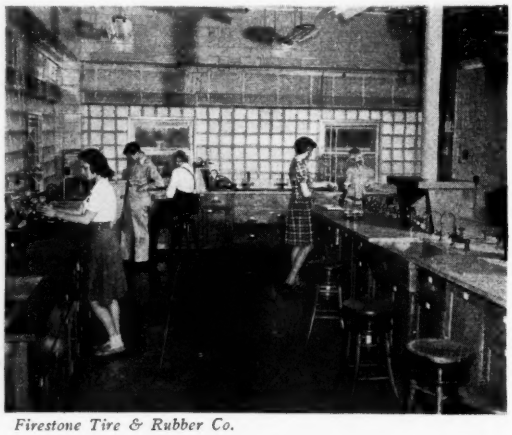

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Fig. 9. A View of Part of the Chemical Laboratory in the Evaluation Laboratory Building

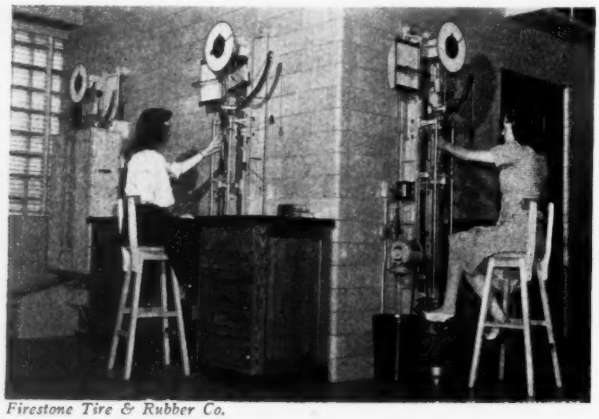

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Fig. 8. A Corner of the Physical Testing Room in the Evaluation Laboratory; the Scott Tensile Machine Equipped for Testing above Room Temperature Is on the Extreme Left

THE PHYSICAL TESTING LABORATORY. Physical testing equipment in this room includes three Scott tensile machines, one of which is equipped with a cabinet for making these tests at temperatures as high as 250° F. Figure 8 shows these three tensile machines. A United Shoe Machinery Co. clicker adapted for dieing out test samples eliminates the necessity of the usual hand operation here. For flexing tests a Goodrich and a De Mattia machine are available, the latter arranged so that tests may be run at temperatures up to 250° F. Other equipment includes a Goodyear-Healy pendulum, apparatus for determining torsional hysteresis, T-50 testing apparatus, and a Bashore-Precision resiliometer. A du Pont and a Bureau of Standards abrasion machine are installed in a separate room, and another small room for low-temperature storage and testing is provided. The room across the corridor in which accelerated aging tests can be carried out has four oxygen bombs and two Geer ovens installed in it.

THE CHEMICAL LABORATORY. The chemical laboratory in this building of necessity contains much of the same

(Continued on page 537)

A Low-Temperature Stiffness Test for Elastomers[1]

Ross E. Morris,[2] Robert R. James,[2] and Edward R. Evans[2]

MOST synthetic vulcanizates stiffen more than natural vulcanizates at low temperatures. This behavior has aroused considerable interest in the development of suitable tests for the cold resistance of synthetic vulcanizates. Inasmuch as all rubbers gradually stiffen and finally become brittle as the temperature is lowered, two general types of cold resistance tests have been developed, viz., stiffness tests and brittleness tests. The stiffness tests involve a quantitative measurement of the resistance to deformation of the specimens; the brittleness tests consist in determining the temperature at which the specimens will fracture when rapidly bent. We are concerned here only with stiffness testing.

Previous Stiffness Tests

Most of the low-temperature stiffness tests which have been devised determine the flexural properties of the specimens. This is the case with the tests developed by Koch,[3] McCortney and Hendrick,[4] Kish,[5] Werkenthin,[6] Green, Chollar, and Wilson,[7] and Liska.[8] The remainder of the stiffness tests apply stress to the specimen in other ways. Yerzley and Fraser[9] developed a torsion test and a Shore durometer test. Clash and Berg[10] described a torsion test. Russell,[11] Graves and Davis,[12] and Buckley and Chaney[13] proposed tensile tests.

Advantages of New Method

In view of the considerable number of cold-stiffness tests which have been suggested, the presentation of yet another stiffness test requires justification. This can best be done by pointing out the advantages of the new test for development and specification work. The following advantages are claimed for the new test:

1. Set may be determined as well as stiffness.
2. The test specimens are very small and can be prepared readily from almost all rubber goods.
3. Air is used as the cold transfer medium instead of alcohol, which swells some elastomers.
4. The cold-generating apparatus can be relatively simple and can be built from inexpensive materials, or it can be purchased commercially.
5. The stiffness-measuring apparatus is simply constructed, and its manipulation is very easy.

[1] The opinions or assertations in this paper are those of the authors and are not to be construed as official or reflecting the views of the Navy Department or the Naval Service at large.
[2] Rubber Laboratory, Navy Yard, Mare Island, Calif.
[3] E. A. Koch, *Kautschuk*, 16, 151 (1940); *Rubber Chem. Tech.*, 14, 799 (1941).
[4] W. J. McCortney and J. V. Hendrick, *Ind. Eng. Chem.*, 33, 579 (1941); *Rubber Chem. Tech.*, 14, 736 (1941).
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[6] T. A. Werkenthin, Report to Technical Committee, Mechanical Division, A.S.T.M., May 6, 1943.
[7] B. K. Green, R. G. Chollar and G. J. Wilson, *Rubber Age (N. Y.)*, 54, 319 (1943).
[8] J. W. Liska, *Ind. Eng. Chem.*, 36, 40 (1944).
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[10] R. F. Clash and R. M. Berg, *Ind. Eng. Chem.*, 34, 1218 (1942).
[11] J. J. Russell, *Ibid.*, 32, 509 (1940).
[12] F. L. Graves and A. R. Davis, INDIA RUBBER WORLD, 109, 41, (1943).
[13] D. J. Buckley and A. L. Chaney, Abstract of paper presented before the fall meeting of the Division of Rubber Chemistry, A. C. S., Oct. 5-7, 1943, New York, N. Y.

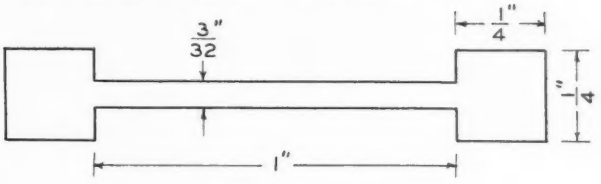

Fig. 1. Test Specimen

6. The stiffness-measuring apparatus employs a weight for application of load to the test specimen instead of a spring. Therefore there is no need of frequent calibration as when a spring is employed.
7. The precision of the method is believed to be at least as high as the precision of the other cold-stiffness tests.

Description of New Low-Temperature Stiffness Test

The new test consists of stretching a small specimen in cold air by means of a definite load acting vertically and measuring the elongation obtained. The less is the elongation under load, the stiffer is the stock. Set is determined by removing the load and observing the recovery of the specimen after a given time.

The test specimen is the ordinary T-50 specimen shown in Figure 1. The thickness of the specimen is optional. The thickness used in most of the tests reported herein was 1/16-inch. This small specimen can be prepared conveniently from almost all types of rubber goods using the die manufactured by Henry L. Scott Co. The clamps for holding the specimen during test can also be obtained from this company.

Inasmuch as the test involves measuring deflection under a constant load, it is imperative that the load per cross-sectional area be maintained absolutely uniform from one specimen to the next specimen, notwithstanding possible variations in width and thickness of the specimens. Thus it is necessary to select some load per cross-sectional area as standard and adjust the actual stretching weight to conform with this value. In this work it was decided to standardize upon three loads, 256 p.s.i., 512 p.s.i., and 1024 p.s.i. These loads correspond to stretching weights of 1½, three and six pounds, respectively, acting upon a specimen having a cross-section of 1/16-inch by 3/32-inch. In specification work it may be desirable to employ other loads, depending upon the type of vulcanizate under consideration.

It is important that the specimens shall have a uniform cross-section along their restricted portion. The variation in width or thickness must not exceed 0.002-inch if precise results are desired. The authors have experienced no trouble in preparing samples to this tolerance. The T-50 specimens were died out after buffing. The Bausch & Lomb measuring microscope with 20 millimeter scale divided in 0.1 millimeter divisions is a convenient and inexpensive device for measuring accurately the width of the specimens.

The upper and lower clamps which hold the specimen during test are shown in Figure 2. The rod attached to the lower clamp holds the weight by means of the hook on its lower end. A scratch on the rod serves as an index to enable the elongation of the specimen to be measured outside of the cold box by means of a steel ruler, which is divided in hundredths of an inch. The combined weight of the lower clamp and rod is only 0.04-pound and therefore may be neglected. The thermal elongation of the rod

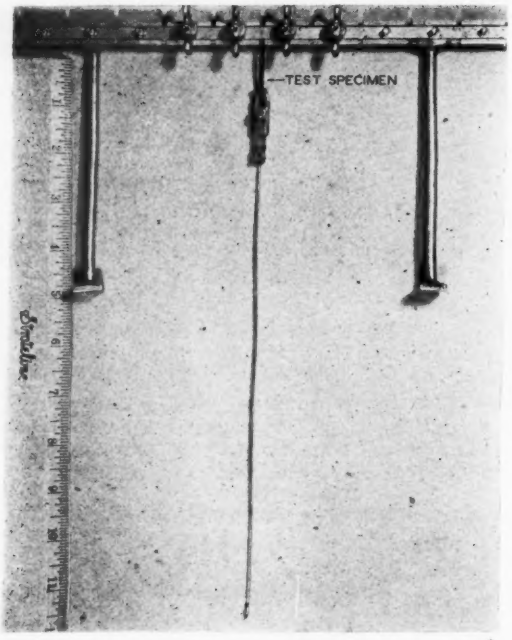

Fig. 2. Test Specimen in Clamps with Measuring Rod on Lower Clamp

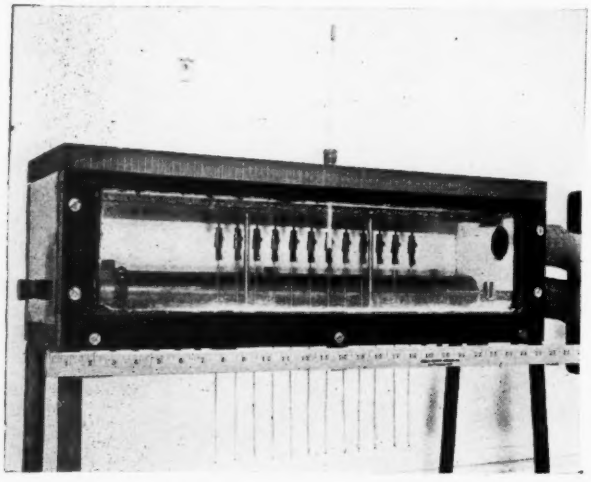

Fig. 3. Cold Box Containing Clamped Specimens

due to being pulled out of the cold box by the weight is also negligible.

A convenient weight for this test is a metal cup containing fine lead shot and provided with a wire loop for attaching to the hook on the rod. This weight can be readily adjusted to obtain the desired load per cross-sectional area of the specimen.

The positions of the clamps, the specimens, and the rods in the cold box are illustrated in Figure 3. The rods pass through ¼-inch holes in the bottom of the cold box. These holes are closed by lightly stuffing cotton alongside the rods except at the time of measurement.

It should be understood that a cold box with a glass front is not required for this test since it is not necessary to see the specimens during test. The cold box, however, must be arranged for good circulation of air.

The authors employed a special apparatus (Figure 4) for blowing cold air at constant temperature into the cold box. This apparatus is made by Tenney Engineering, Inc., and is called "Packaged Air." This apparatus is provided with outlet and return ducts for connection with any box in which it is desired to maintain constant temperature. The outlet and return ducts of the "Packaged Air" apparatus were connected to the cold box used in this investigation by means of the rubber ducts shown in Figure 5. A baffle was placed in the end of the outlet duct to prevent the cold air from blowing directly on the specimens.

The "Packaged Air" apparatus is charged with dry ice. By means of a blower the air from the return duct is drawn over electric strip heaters or by-passed by a damper valve through dry ice before being blown through the outlet duct. The temperature of the air is controlled within plus or minus 1° C. by a thermoregulator, which operates the electric strip heaters and the damper valve.

The "Packaged Air" apparatus is a convenient source of constant-temperature cold air, but a less-elaborate source of cold air can be used for the stiffness test. A simpler apparatus which has been found suitable is diagramed in Figure 6. This apparatus can be built from parts to be found in most laboratories. It combines the cold generation and testing in one box.

Preliminary experiments with specimens prepared from a Hycar OR-15 stock (Table 1) showed that the conditioning period should be two hours before stretching, and the time of reading the elongation should be three minutes

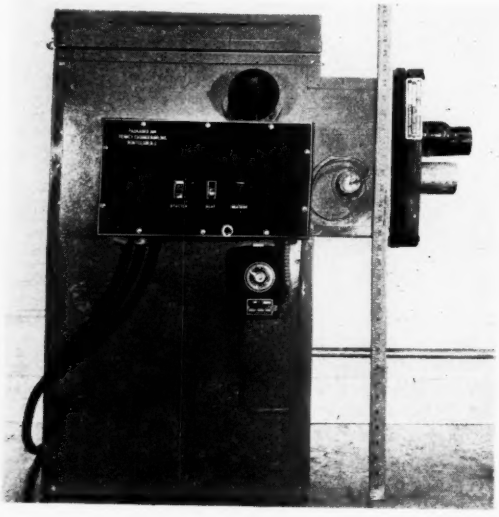

Fig. 4. "Packaged Air" Apparatus

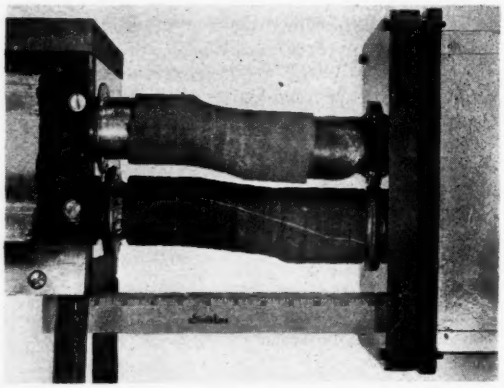

Fig. 5. Rubber Ducts for Circulation of Cold Air between "Packaged Air" Apparatus and Box

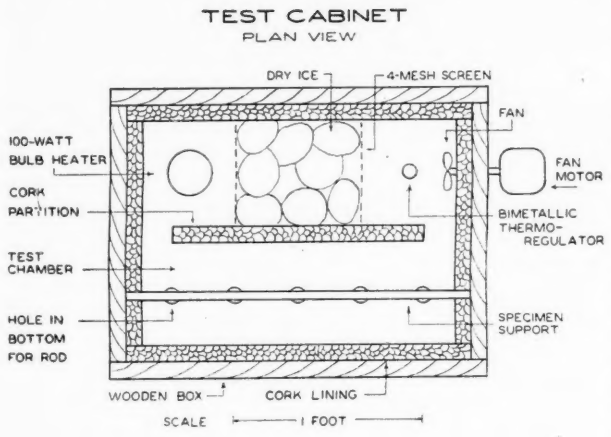

Fig. 6. Optional Apparatus for Low-Temperature Stiffness Test

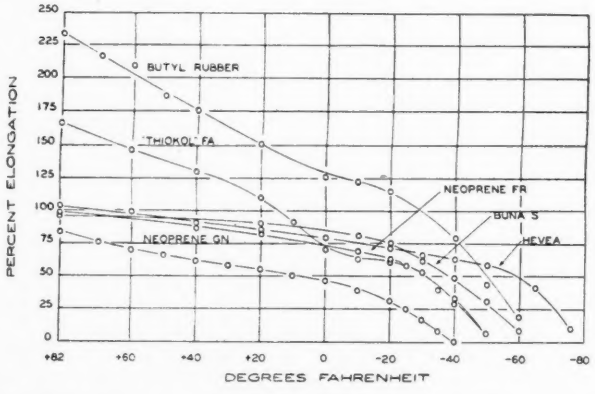

Fig. 7. Relation between Elongation at 512 P.S.I. Load and Temperature

after hanging on the weight. These intervals were adopted as standard.

Precision of Tests

It is important that all testing methods for rubbers shall have a fair degree of precision. In other words the results shall be reproducible. The precision of the proposed stiffness test was determined by conducting numerous tests at each of several temperatures on the *Hevea* stock, the plasticized Perbunan 26 stock, and the plasticized Hycar OR-15 stock formulated in Table 1, and two commercial neoprene hose cover stocks and then analyzing the data from each series of tests on the same compound, tested under different conditions by determining the standard deviation and per cent. standard deviation for each series. The standard deviation, which may be stated to be the root-mean-square deviation of a group of numbers from their average, under these conditions specifically defines the range on either side of the mean value within which two-thirds of the test values may be expected to fall. Therefore the smaller the standard deviation, the more dense the clustering and the greater the indicated precision. The per cent. standard deviation or coefficient of variation, which is the standard deviation divided by the arithmetical mean multiplied by 100, is used in order to compare the relative variability of two or more series of tests since in these tests, as mentioned below, the standard deviation remains about the same as the temperature is lowered, while the elongation decreases.

In the case of the *Hevea* and plasticized Hycar OR-15 stocks, tests were performed on specimens which had been died out with the grain and also on specimens which had been died out radially. Some of the radially died specimens were with the grain; some were across the grain, and some were intermediate. The Perbunan 26 stock was tested at three different specimen thicknesses. All specimens were died out with the grain. The neoprene hose cover specimens were all died out in the same direction, but it is not known whether these were with the grain or across the grain.

The statistical data, presented in Table 2, show that the proposed stiffness test yields quite reproducible results. Greater precision is obtained by dieing out the specimens in the same direction instead of radially because of the grain effect. The precision of the test, measured by the per cent. standard deviation, generally decreases as the temperature is lowered because the actual magnitude of the standard deviation remains approximately the same although the elongation decreases. Changing the thickness of the specimens, but keeping the load constant per cross-sectional area does not alter significantly the results of the stiffness test or the precision of these results.

The precision of the set measurements of the plasticized Perbunan 26 stock was determined at –20° F. in conjunction with the above-mentioned stiffness tests. The set measurements were made 5, 10, 15, and 60 seconds after removal of the stretching weight (512 p.s.i. load), which had acted on the specimen for exactly three minutes. The

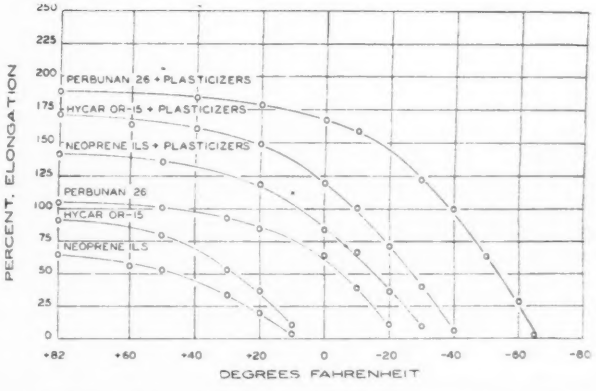

Fig. 8. Relation between Elongation at 512 P.S.I. Load and Temperature

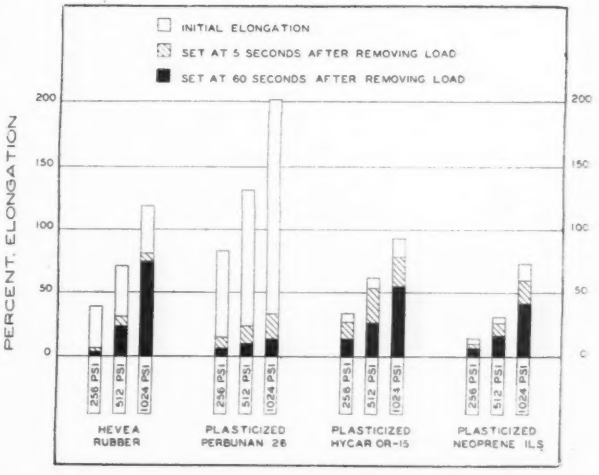

Fig. 9. Elongations at Various Loads and Corresponding Sets, All at –20° F.

TABLE 1. RECIPES

	Hevea Stock	Buna S Stock	Butyl Stock	Neoprene GN Stock	Neoprene FR Stock	"Thiokol" FA Stock
Smoked sheet	100.0	....	....	....	....	....
GR-S	....	100.0	....	....	....	....
GR-I	....	....	100.0	....	....	....
Neoprene GN	....	....	....	100.0	....	....
Neoprene FR	....	....	....	....	100.0	....
"Thiokol" FA	....	....	....	....	....	100.0
SRF black (40 volumes)	78.3	76.6	78.2	58.5	63.2	54.1
Zinc oxide	5.0	5.0	5.0	5.0	....	10.0
Light magnesia	....	....	....	4.0	....	....
Litharge	....	....	....	....	10.0	....
Stearic acid	2.0	....	1.0	0.5	1.0	0.5
Phenyl alpha naphthylamine	1.0	1.0	....	2.0	2.0	....
Diphenylguanidine	....	....	....	....	....	0.1
Dibenzothiazyl disulphide	0.8	....	....	....	....	0.3
Zinc dimethyl dithiocarbamate	0.1	....	....	....	....	....
Tetramethyl thiuram monosulphide	....	0.5	....	....	....	....
Tetramethyl thiuram disulphide	....	....	1.0	....	....	....
Mercaptobenzothiazole	....	....	0.5	....	....	....
Sulphur	2.5	2.0	1.5	....	1.0	....

	Perbunan 26 Stock	Plasticized Perbunan 26 Stock	Hycar OR-15 Stock	Plasticized Hycar OR-15 Stock	Neoprene ILS Stock	Plasticized Neoprene ILS Stock
Perbunan 26	100.0	100.0	....	....	....	....
Hycar OR-15	....	....	100.0	100.0	....	....
Neoprene ILS	....	....	....	....	100.0	100.0
SRF black (40 volumes)	74.2	74.2	72.0	72.0	58.1	58.1
Zinc oxide	5.0	5.0	5.0	5.0	10.0	10.0
Light magnesia	....	....	....	....	10.0	10.0
Stearic acid	1.0	1.0	1.0	1.0	0.5	0.5
Dibutyl phthalate (10 volumes)	....	10.7	....	10.5	....	8.5
Dibutyl sebacate (10 volumes)	....	9.6	....	9.3	....	7.5
Tributoxy ethyl phosphate (10 volumes)	....	11.5	....	11.1	....	9.0
Phenyl alpha naphthylamine	1.0	1.0	1.0	1.0	2.0	2.0
Dibenzothiazyl disulphide	1.75	1.75	1.75	1.75	....	....
Diorthotolyl guanidine salt of dicatechol borate	....	....	....	....	1.0	1.0
Sulphur	1.75	1.75	1.75	1.75	....	....

TABLE 2. STATISTICAL DATA ON STIFFNESS TESTS

Stock	Temperature of Test ° F.	Number of Observations (Load = 512 P.S.I.)	Thickness of Specimens Inch	Highest Elongation in Group %	Lowest Elongation in Group %	Average Elongation of Group %	Standard Deviation	% Standard Deviation
*Hevea**	+82	24	0.0625	98	90	94	2.2	2.4
	0	24	0.0625	75	68	73	1.5	2.0
	−30	24	0.0625	70	64	66	1.7	2.5
	−60	23	0.0625	53	43	48	2.7	5.7
Hevea†	+82	24	0.0625	113	103	107	2.5	2.4
	0	24	0.0625	86	77	81	2.4	2.9
	−30	24	0.0625	81	64	71	4.5	6.3
	−60	24	0.0625	54	41	48	3.2	6.6
Plasticized Perbunan 26*	−20	23	0.040	137	125	131	3.4	2.6
	−20	24	0.060	139	121	132	4.0	3.0
	−20	21	0.080	145	128	134	4.6	3.4
Plasticized Hycar OR-15*	+82	24	0.0625	172	160	167	2.9	1.7
	0	24	0.0625	126	109	117	4.8	4.1
	−30	24	0.0625	31	19	25	3.4	13.6
Plasticized Hycar OR-15*	+82	24	0.0625	186	158	171	9.0	5.3
	0	24	0.0625	141	110	120	8.0	6.7
	−30	24	0.0625	33	15	24	5.9	24.7
#1 Neoprene Hose Cover*	0	24	0.0625	122	102	112	5.7	5.1
	−20	24	0.0625	92	77	86	4.0	4.6
#2 Neoprene Hose Cover*	0	23	0.0625	58	49	53	2.2	4.2
	−20	24	0.0625	34	25	31	2.6	8.2

* Specimens died out in the same direction. † Specimens died out radially.

TABLE 3. STATISTICAL DATA ON SET TESTS—PLASTICIZED PERBUNAN STOCK AT −20° F.

Test	Number of Observations	Highest Value in Group %	Lowest Value in Group %	Average Value in Group %	Standard Deviation	% Standard Deviation
Thickness of Specimens = 0.040-Inch						
Elongation with 512 p.s.i. load	23	137	125	131	3.4	2.6
Set at 5 seconds	23	36	19	26	4.8	18.5
10 seconds	23	27	14	19	3.6	19.1
15 seconds	23	22	11	15	3.0	19.9
60 seconds	23	12	7	9	1.8	19.5
Thickness of Specimens = 0.060-Inch						
Elongation with 512 p.s.i. load	24	139	121	132	4.0	3.0
Set at 5 seconds	24	30	20	25	2.9	11.5
10 seconds	24	22	15	18	2.1	11.9
15 seconds	24	19	12	15	2.0	13.0
60 seconds	24	13	8	10	1.4	14.3
Thickness of Specimens = 0.080-Inch						
Elongation with 512 p.s.i. load	21	145	128	134	4.6	3.4
Set at 5 seconds	21	27	15	21	3.7	17.6
10 seconds	21	21	9	15	2.8	18.5
15 seconds	21	19	7	13	2.7	20.4
60 seconds	21	15	5	8	2.1	26.8

TABLE 4. CURES AND PHYSICAL PROPERTIES

Stock	Cure	Tensile Strength P.S.I.	Ultimate Elongation %	Modulus at 200% Elongation	Shore Hardness (10 Seconds on ¼-Inch)
Hevea	20 min. @ 260° F.	3070	450	1600	65
Buna S	20 min. @ 287° F.	1900	200	1900	66
Butyl	150 min. @ 307° F.	1200	390	910	65
Neoprene GN	40 min. @ 287° F.	2760	300	2190	73
Neoprene FR	40 min. @ 287° F.	2240	200	2240	65
"Thiokol" FA	40 min. @ 298° F.	1300	400	850	61
Perbunan 26	60 min. @ 274° F.	2730	300	1920	64
Plasticized Perbunan 26	60 min. @ 274° F.	1700	390	800	46
Hycar OR-15	60 min. @ 274° F.	2810	320	2260	69
Plasticized Hycar OR-15	60 min. @ 274° F.	2180	500	960	50
Neoprene ILS	40 min. @ 307° F.	2980	200	2980	75
Plasticized Neoprene ILS	40 min. @ 307° F.	1970	270	1370	58

(*Continued on page 534*)

Recent Russian Literature on Natural and Synthetic Rubber—X

M. Hoseh

Heat Transfer Coefficient of Heat Exchangers Used in the SK Industry. M. I. Kuznetsov, *Kauchuk i Rezina,* 4/5, 81-86 (1939). **S-30.**

A mathematical analysis of heat transfer in the production of SK is given. The result of this analysis is a number of formulae for calculating the heat transfer from the distillate through the walls to the cooling liquid. To facilitate the use of the derived formulae the author devised a set of nomographs. With the aid of these the operational data required are readily read off.

Thread Made from Soviet Rubber. A. P. Tugarina and K. I. Merkulova, *Kauchuk i Rezina,* 4/5, 86-88 (1939). **SN-35.**

To obviate the necessity of using imported natural rubber for making rubber thread, experiments were initiated to produce such thread from domestic materials. Thread produced from SK-B (butadiene polymer) was unsatisfactory; it was quite strong, but not elastic enough. Nor did mixed SK and NK give satisfactory results. The results of experiments with Sovprene were quite satisfactory as far as the properties of the thread were concerned. The Sovprene thread compared very favorably with thread made from NK. However, because of the pungent odor given off by Sovprene, the thread made from it could not replace natural rubber thread completely. Further experiments were made with *tau-saghyz* and *kok-saghyz.* The former gave a product yielding but little to thread made of natural rubber. Thread from *kok-saghyz* was not inferior to that of *Hevea* and in certain mechanical properties, as strength and relative elongation, surpassed natural rubber.

Repairing Automobile Tires. F. K. Miller, S. I. Dub, and K. F. Gagina, *Kauchuk i Rezina,* 4/5, 88-95 (1939). **SN-36.**

A review of the problems encountered in rebuilding tires and how to cope with them is presented.

Heat Conductivity of Rubber. L. S. Frumkin and Yu. B. Dubinker, *Kauchuk i Rezina,* 6, 25-34 (1939). **SN-37.**

While data are available for the specific heat conductivity of rubber, no data are available on the rate of temperature change occurring inside layers of rubber. The authors have worked out a method to determine and compare the temperature conductivity of rubber mixes. The determinations are made on balls of approximately 60-millimeter diameter. Three such balls are put on a specially designed holder and placed within a closed cylinder. The measurements are taken with a copper-constantan thermo-element and the usual auxiliary apparatus. Structural details of the set-up are given. The temperature conductivity of all mixes increased with the temperature. In mixes containing no carbon black the addition of ZnO in the usual amounts lowered the temperature conductivity. In mixes filled with carbon black, ZnO raised the temperature conductivity insignificantly. It seems to follow that adding ZnO to mixes to enhance the rate of their heating-up is not justified. Adding up to 25% of carbon black raises the temperature conductivity. Further additions lower the conductivity somewhat. Mixes made according to the same recipe, but using different kinds of carbon black have different conductivities. Lowest temperature conductivity was found in a mix made with carbon black P-33. Then follow in increasing order: Maikop, Gastex, Thermax, Kudinov, and Yaroslav carbon blacks. This points to the fact that lamp blacks impart a higher conductivity to mixes than do gas blacks.

Vulcanization of Rubber in a High Frequency Field. A Preliminary Communication. P. I. Medvedchuk, I. S. Khimudis, and Ya. N. Nemirovskii, *Kauchuk i Rezina,* 6, 36-37 (1939). **SN-38.**

Vulcanization in a high frequency field was tested on solutions and films of natural and synthetic rubber. The solutions were 1, 2, and 3% of NK and similar concentrations of SK. The medium of the solution was benzene, a non-polar liquid. The films contained 5% of ZnO. The time of exposure to the field was 1, 5, 10, and 20 minutes. Both the solutions and the films of natural as well as of synthetic rubber vulcanized in the high frequency field. The solutions vulcanized better than the films. The rate of vulcanization was rapid and marked results were observed even after one minute. As the duration of exposure increased, the quantity of fixed sulphur increased.

Young's Modulus of Vulcanized Rubber. G. Sh. Izraelit, *Kauchuk i Rezina,* 6, 38-40 (1939). **SN-39.**

A mathematical analysis of the Young modulus, as applied to vulcanized rubber, leads the author to conclude that Young's modulus of vulcanized rubber should be determined on a dynamometer using as criterion the elongation and not the tension. The Schopper apparatus is not suitable for use on rubber. In calculating the results should be used the formula:

$$E_\epsilon = \frac{P}{S_{o\epsilon}}(1 + \epsilon)$$ where ϵ is elongation, and the other terms are as usual.

Rubber from *Krym-saghyz.* A. M. Ignat'ev, *Kauchuk i Rezina,* 6, 41-44 (1939). **N-13.**

The physical and physico-chemical properties of this rubber are given. The product made from it compares favorably with that of *tau-saghyz* and *kok-saghyz.*

Adaptation of Gas Polymerized SK in Automobile Tires. P. I. Stepanov, *Kauchuk i Rezina,* 6, 53-54 (1939). **S-31.**

The use of gas polymerized SK is indicated as having considerable advantage. Points in favor of gas polymerized SK are: (1) it simplifies the technological process; (2) the process of manufacture is less hazardous; (3) SK polymerized in this manner is more uniform in composition. The use of gas polymerized SK permits a 20-30% reduction in the amount of SK

rubber used in manufacturing a given product. This type of SK is harder and settles out more in solution, and it requires more plasticizer and filler in compounding. Several compounds for tires containing gas polymerized SK were tried out. The crude mix handled easily, and laboratory tests on the product were satisfactory. Further work of this type of SK is planned.

Mica Lubricant. B. S. Aronovich and Kh. E. Malkina, *Kauchuk i Rezina,* 6, 68-69 (1939). **M-19.**

Experiments were made in an attempt to determine the best composition for a lubricant to be used on rubber products to prevent their sticking to hot metal surfaces. Very good results were obtained with a solution of rubber in benzene to which was added ground mica. The concentration of rubber in the solution was kept between 1:20 and 1:25. One part of ground mica was added for each 4.0 to 4.5 parts of the rubber solution. Instructions for the preparation of the lubricant follow. Cut 400 grams of SK into two centimeters by 0.5-centimeter. Take five kilograms of benzene; cover the cut SK with a part of this benzene. As the SK swells, add more benzene. Keep the solution at 25° C. This stock solution has a rubber content of between 1:10 and 1:12. For use add five kilograms more of benzene and 2.3 kilograms of ground mica. The mica is added with constant stirring. The mixture is applied on the rubber and the metal surface with a brush. Before each use the mixture should be stirred thoroughly.

The Effect of Plasticizers on the Properties of Rubber Synthesized from Divinyl. Part II. S. L. Talmud and T. I. Yurzhenko, *Kauchuk i Rezina,* 7, 15-21. **S-32.**[1]

The investigation continued with the testing of various substances for their suitability as plasticizers and dispersants for SK. Three main groups were investigated: high boiling (154-357° C.) esters, terpenes, and products from destructive distillation of wood. In all 24 substances were tested. These were used in mixes in amounts of 5-25 parts by weight per 100 parts of SK. With each test were run controls in which the tested substance was replaced by Rubrax and stearic acid. The results of the tests are tabulated. With the exception of hexyl acetate, an increase in the quantity of the esters increased the plasticity of SK. Triacetin, notwithstanding its inability to dissolve SK, raised the plasticity considerably. The best physico-mechanical results were obtained with dibutyl phthalate, diethyl phthalate, and hexyl acetate added in amount of 5-15 parts by weight, and with terpenyl acetate and triacetin added in amounts of five parts by weight. Almost all of these esters accelerated aging, except the phthalates added in any amount and benzyl acetate and terpenyl acetate added in amounts of 25 parts by weight. As to terpenes, cineole, cymenol (tested together with the terpenes), and terpineol in any proportions improved the physico-mechanical properties of SK. Terpineol D gave satisfactory results only when used in quantities of five parts by weight. All the substances of the third group, except heavy oil and gas generator tar, affected SK adversely. These two exceptions may be used up to 25 parts by weight. The beneficial effect of the esters, the authors ascribe to their dispersing action rather than to their plasticizing effect. The higher the surface tension of these substances the more effective dispersants they are. The terpenes act more like plasticizers, except for a polar terpene (most of the tested esters were polar) like Terpineol D which acts as a dispersing agent.

[1] For Part I see INDIA RUBBER WORLD, Jan. 1944, p. 368, S-27.

(*To be continued*)

Low-Temperature Stiffness Test

(*Continued from page 532*)

the set test is not so precise as the stiffness test.

Results Obtained

Stiffness data for the *Hevea* stock and some synthetic stocks are plotted *versus* temperature in Figures 7 and 8. Each point in these graphs is the average of six determinations. The recipes and certain physical properties of these stocks are given in Tables 1 and 4, respectively. All of the stocks contain the same volume of semi-reenforcing furnace black, and the plasticized stocks contain the same volume of plasticizers.

All of the stocks except the Butyl and "Thiokol" FA stocks exhibited the same type of stiffness-temperature curve. The latter stocks gave a very high elongation at room temperature, and the elongation decreased rapidly as the temperature decreased. Both curves possessed a slight inflection at about –10° F. The curves for the *Hevea*, Buna S, and Neoprene FR stocks were quite similar down to about –20° F. Below this temperature the *Hevea* stock was the most flexible, and the Neoprene FR stock was the least flexible. The addition of plasticizers to the Perbunan 26, Hycar OR-15, and Neoprene ILS stocks enhanced their flexibility at room temperature and at lower temperatures.

The elongations and sets at –20° F. of the *Hevea,* plasticized Perbunan 26, plasticized Hycar OR-15, and plasticized Neoprene ILS stocks are graphed in Figure 9. The low set of the plasticized Perbunan 26 stock is noteworthy.

Further Advantages

The usefulness of the proposed stiffness test is not limited to determining the effect of low temperature; it may also be used to characterize a stock at room temperature. Like the Shore hardness test, the stiffness test requires relatively inexpensive and uncomplicated equipment. It has the advantage over the Shore hardness test of being more precise, although it is less convenient. An example of where the stiffness test should find application is in the determination of the rate of cure of small, thin molded items on which a reliable Shore hardness test or regular tensile test cannot be made. Another example is in the determination of plastic flow under constant stress at high temperatures.

The authors wish to express appreciation for the assistance of Harold N. Olsen in constructing some of the apparatus used in this study.

Natural and Synthetic Pigments Sales

Total sales in the United States of natural mineral pigments and manufactured iron oxides were 100,666 short tons, valued at $8,029,057, in 1943, compared with 97,327 short tons, valued at $7,764,232, the year before, according to the Bureau of Mines, United States Department of the Interior, Washington, D. C. In view of negligible civilian construction the increase pointed to expanded military uses. Research on infra-red reflecting earth pigments was continued with respect to wartime camouflage, and a Canadian laboratory investigated the possibility of using infra-red reflecting paints for civilian uses on the theory that reflection of infra-red rays means reflecting heat. Objects suggested for such painting were roofs and gasoline storage tanks.

Further Studies on the Effect of Temperature on the Resilience of Natural and Synthetic Rubber—II

H. C. Jones[1] and E. G. Snyder[1]

TENSILE properties of the stocks compounded with plasticizers are charted in Figures 1, 2, and 3. Cumar MH2-½ increased tensile strength and breaking elongation, but softened the modulus, and the effect of 20 parts was more pronounced than with 10 parts of the resin. The ultimate tensiles for the 50-volume stocks were slightly higher than those with the 25-volume compounds, and the coumarone-indene resin influenced physical properties in the same manner as was observed with the 25-volume zinc oxide compounds. Tensile strength of the 60-volume stock with 30 parts of Cumar MH2-½ was poorer than the other compounds. In the series of tests with Turgum (Figure 2) tensile strength was improved with increments of the turpentine gum. Breaking elongations were increased, and 300% modulus values lowered over the same range. The 50-volume stocks developed higher ultimate tensiles than the 25-volume compounds. With 60 volumes of zinc oxide and 30 parts of Turgum, the tensiles were about equal to the 50-volume compounds. The stock with 10 parts of Naftolen had somewhat lower tensile and modulus than the control stock without a plasticizer, while the breaking elongation was about equal to that of the control. Turgum retarded the rate of cure because of the slight acidity of this resin. Tensile properties for the Bayol, Naftolen, Cumar series are charted in Figure 3. Cumar MH2-½ improved ultimate tensiles, and the blend of Naftolen and Cumar MH2-½ had tensiles about equal to the control. Naftolen and Bayol degraded tensile strength, and Bayol impaired this property somewhat more than Naftolen.

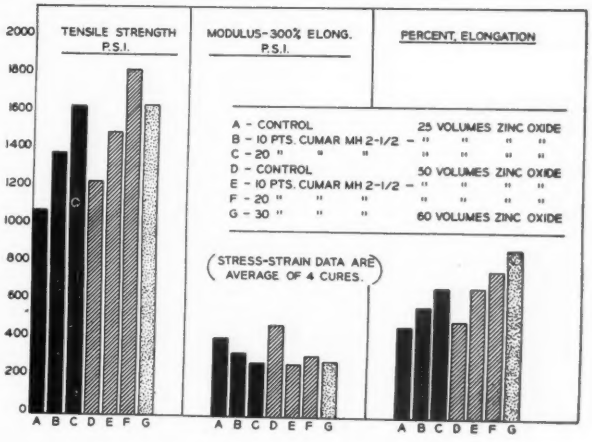
TENSILE STRENGTH P.S.I.
MODULUS-300% ELONG. P.S.I.
PERCENT ELONGATION
A - CONTROL
B - 10 PTS. CUMAR MH 2-1/2 - " " " "
C - 20 " " " " " " " "
D - CONTROL
E - 10 PTS. CUMAR MH 2-1/2 - " " " "
F - 20 " " " " " " " "
G - 30 " " " "
25 VOLUMES ZINC OXIDE
50 VOLUMES ZINC OXIDE
60 VOLUMES ZINC OXIDE
(STRESS-STRAIN DATA ARE AVERAGE OF 4 CURES.
A B C D E F G

Fig. 1. Tensile Properties of GR-S Stocks

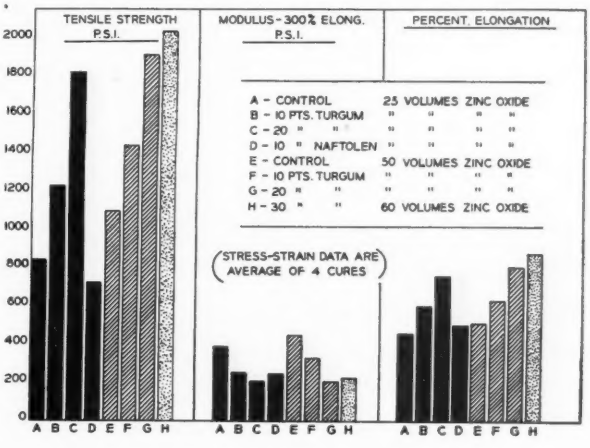
TENSILE STRENGTH P.S.I.
MODULUS-300% ELONG. P.S.I.
PERCENT ELONGATION
A - CONTROL
B - 10 PTS. TURGUM
C - 20 " "
D - 10 " NAFTOLEN
E - CONTROL
F - 10 PTS. TURGUM
G - 20 " "
H - 30 " "
25 VOLUMES ZINC OXIDE
50 VOLUMES ZINC OXIDE
60 VOLUMES ZINC OXIDE
(STRESS-STRAIN DATA ARE AVERAGE OF 4 CURES
A B C D E F G H

Fig. 2. Tensile Properties of GR-S Stocks

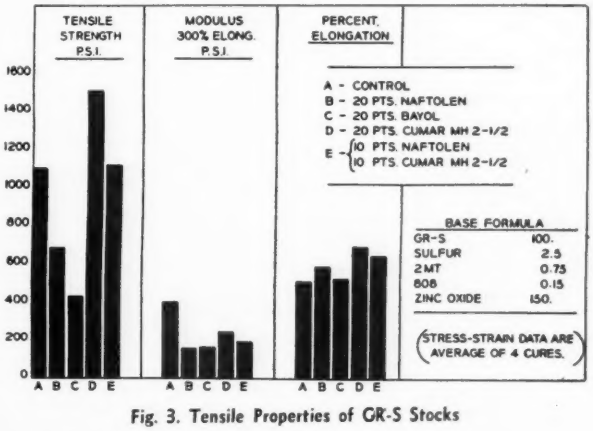

Fig. 3. Tensile Properties of GR-S Stocks

Summary of the Effect of Plasticizers in GR-S

In summarizing the data on plasticizers, the indications are that Cumar MH2-½ and Turgum improve tensiles and degrade resilience; while Naftolen and Bayol enhance resilience, but impair tensile properties. These observations suggest a manner in which the plasticizers influence tensile and resilience properties. The wide range in tensile and resilience properties with different plasticizers is believed to be associated with the molecular structure of GR-S. In natural rubber the long-chain molecules develop high gum stock tensiles because of the tendency for the polymer to fiber when stretched. If there is any specific effect of the plasticizer in natural rubber other than a softening action, it is probably obscured by the high inherent strength of natural rubber. The molecules in GR-S are relatively short and tend toward branch chaining, and, because there is no fibering, gum stock tensiles are low. The influence of plasticizers in such a system is considerably magnified. It is the opinion that the petroleum softeners, Naftolen and Bayol, which are liquids at room temperature, function as internal lubricants in the GR-S. When

[1] Development engineering division, technical department, New Jersey Zinc Co. (of Pa.), Palmerton, Pa.

the elastomer is deformed by the impact of the pendulum hammer in the resilience test, the improved mobility of the molecules permits the stock to snap back more rapidly, and a higher resilience is obtained than in the absence of the petroleum plasticizer. In the case of the tensile properties, the short chain butadiene-styrene molecules slide past one another more freely in the presence of the lubricating plasticizers, and lower tensiles result. The stocks compounded with Cumar MH2-½ had higher tensiles than the control stock without the coal-tar resin. It is believed that the resin aids in the wetting of the zinc oxide by the elastomer resulting in an improvement in tensile properties. This opinion is advanced since the same amount of coumarone-indene resin in a GR-S gum stock did not significantly change tensile strength. Furthermore the resin, which is a solid at room temperature, probably increases the rigidity of the compounded stock, and this effect might be expected to contribute to some improvement in tensile properties. When the compound is deformed in the resilience test, the high melting point resin solution in the elastomer probably inhibits molecular movement, and there is a degradation in resilience.

Influence of Sulphur on Temperature-Resilience

The influence of sulphur on the resilience of GR-S stocks compounded with 25 volumes of zinc oxide is shown in Figure 4. From 20 to 100° C. resilience was improved with increments of sulphur from three to five and ten parts. Below room temperature, however, resilience was impaired by the addition of more sulphur. In other words, the slope of the temperature resilience curves of the 3% sulphur compound was somewhat flatter than that of the other stocks, and as sulphur content increased, the slope of the curve became greater. A compound with 20 parts of sulphur had very poor resilience properties below 30° C., but above this temperature was about equal to the 3% and 5% sulphur compounds. Indentation measurements of this series of compounds are plotted in Figure 5 where it will be observed that the dynamic hardness of the compound was directly proportional to the sulphur content; the 20 per cent sulphur compound had the lowest and the 3% sulphur stock the highest indentation values.

Natural Rubber Compounds—Effect of Sulphur on Temperature Resilience

Sulphur has a marked influence on the resilience of natural rubber, and the effect of temperature on resilience becomes quite pronounced when the sulphur content is in the range of 10 to 20 parts. A series of natural rubber stocks was compounded with three, five, ten, and 20 parts of sulphur and tested for resilience over a range of temperatures. The measurements were made on gum stocks and compounds with 100 parts of zinc oxide.

In Figure 6 are plotted temperature-resilience curves for the gum stocks. From 0 to 30° C. resilience was inversely proportional to sulphur content; the 3% sulphur stock had the highest resilience, and the 20% sulphur stock was somewhat stiffer and less resilient than the other compounds. Above 40° C. the 20% sulphur stock had a higher resilience than the compounds with less sulphur. When compounded with 16 volumes of zinc oxide, the 3% sulphur stock had the highest resilience over the temperature range from 0 to 100° C. as compared with the five, ten, and 20% sulphur compounds (Figure 7). At 0° C. the 20% sulphur stock pigmented with zinc oxide had a higher resilience than the corresponding gum stock. The influence of sulphur and pigmentation on dynamic hardness, that is, indentation, is shown in Figure 8. The gum stocks with three, five and 10% sulphur were somewhat softer than the

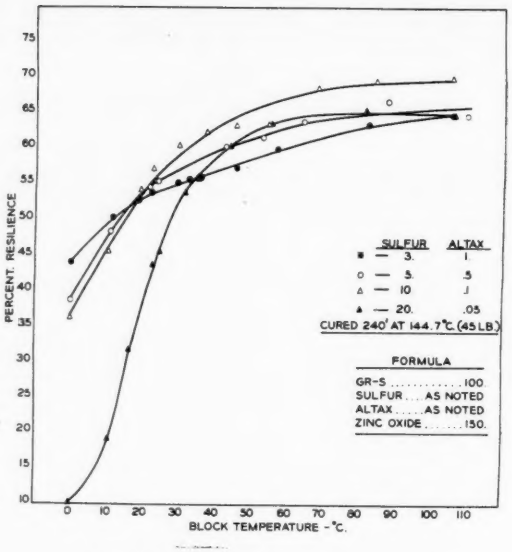

Fig. 4. Temperature-Resilience Measurements on R-S Stocks

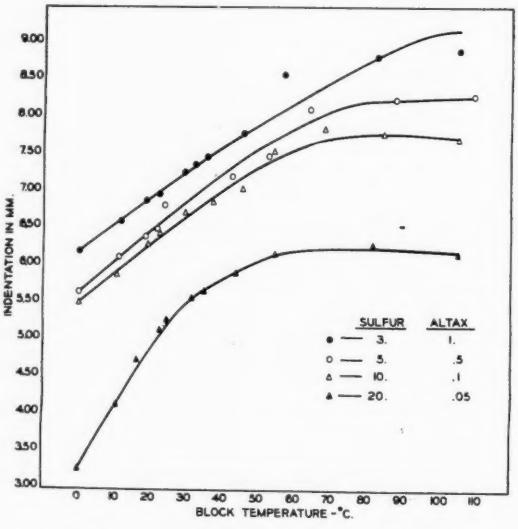

Fig. 5. Indentation Measurements on GR-S Stocks

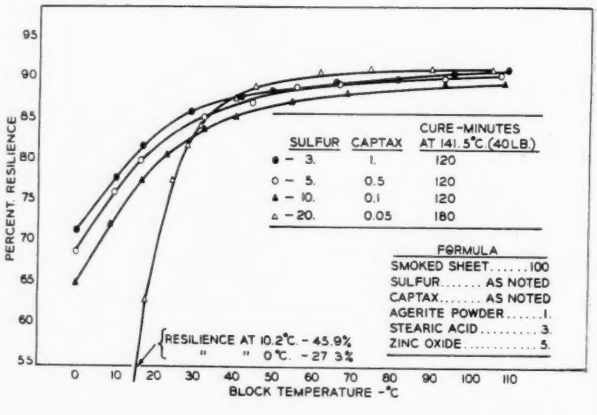

Fig. 6. Temperature-Resilience Measurements on Natural Rubber Gum Compounds

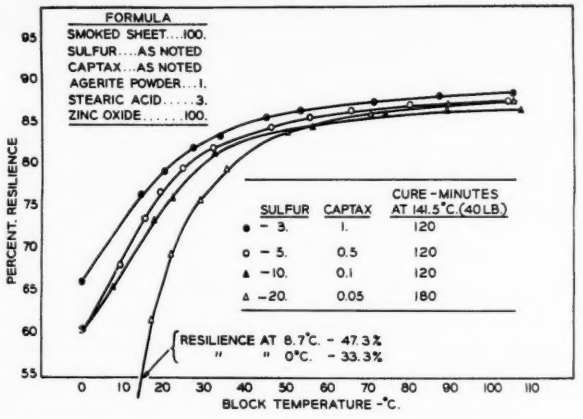

Fig. 7. Temperature-Resilience Measurements on Natural Rubber Stocks Compounded With 16.4 Volumes of Zinc Oxide

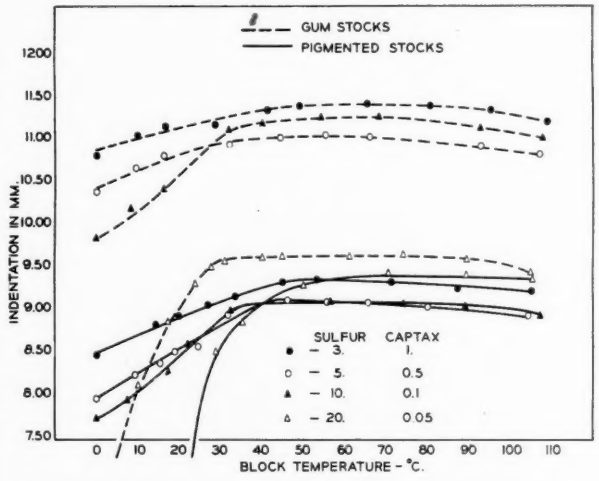

Fig. 8. Indentation Measurements on Gum and Pigmented Natural Rubber Stocks

20% sulphur compounds. However in the corresponding series with 16 volumes of zinc oxide there was a much smaller spread in the indentation values over the range of sulphur loadings. Zinc oxide had a marked softening effect on the 20% sulphur compound in the temperature range above 60° C. This compound was softer than the 16-volume zinc oxide stocks with five and ten parts of sulphur above 40° C.

The rubber compounder usually associates with the sulphur vulcanization of natural rubber a loss of thermoplasticity. One of the functions of the sulphur in natural rubber is to improve the thermal characteristics of this material. Before vulcanization with sulphur, rubber is very thermoplastic, being soft and tacky at elevated temperatures and hard and brittle at low temperatures. Vulcanization of rubber with sulphur minimizes the effect of temperature, and rubber maintains a high degree of flexibility from 0 to 100° C. However the data in Figures 6 and 7 indicate that as the sulphur content of a natural rubber compound is increased above 3%, the stock becomes more temperature-sensitive, that is, more thermoresilient.

Experimental Part

In the measurement of temperature a fine wire iron-constantan thermocouple of the type employed in tire temperature measurements was inserted in the pendulum block (two inches by two inches by one inch) half-way between the top and the bottom and about ½-inch from the side in a position that did not interfere with the impact of the pendulum hammer. The pendulum blocks were heated in an oven at 110° C. for one hour; then they were mounted in the pendulum, and temperature measurements were taken periodically as the block cooled to room temperature. In order that the test sample would not cool down too rapidly heating coils were built in the anvil and around the sample holder. The temperature range from 0 to room temperature was determined after the block had been cooled in a refrigerating unit to about –10° C., and resilience measurements were taken as the block warmed up to room temperature.

Summary

Neoprene GN developed the highest resilience of any of the synthetic elastomers measured over the range from 10° to 100° C. However it is about 5% lower than natural rubber over this range.

Butadiene-acrylonitrile elastomers have a high resilience at elevated temperature, but poor resilience properties at low temperatures, and this condition can be ascribed to the thermosensitivity of the acrylonitrile portion of the polymer.

The tensile and resilience properties of high zinc oxide GR-S stocks are profoundly influenced by plasticizers. A coumarone-indene resin improves tensiles, but degrades resilience; while the petroleum plasticizers, Naftolen and Bayol, have the opposite effect on physical properties.

The resilience of both GR-S and natural rubber combinations are markedly affected by the sulphur content, and this phenomenon is particularly true with 10 and 20 parts of sulphur in the compound.

Government Pilot Plant

(*Continued from page 528*)

equipment found in the laboratory in the pilot plant building as well as additional special equipment not required in the pilot plant laboratory. In this laboratory the work of analyzing raw materials not directly under actual investigation in the pilot plant, and special rubbers produced in other plants is carried out. In effect, long-term chemical research and development work will be conducted here; while the laboratory in the pilot plant will function as the main control laboratory. A view of the interior of this laboratory appears in Figure 9.

Personnel

The pilot plant and evaluation laboratory, when completely staffed, will be operated by about a hundred chemists, chemical engineers, and technicians, both men and women. An appreciable number of the men will be officers of the Chemical Warfare Service of the United States Army, since in these days of shortage of chemists and engineers it is necessary to draw on this source of supply in order to initiate and to carry on as rapidly as possible the extremely important work for which this pilot plant and evaluation laboratory were designed and built.

The program for both pilot plant and laboratory is being administered by the Development and Research Compounding Branch of the Office of the Rubber Director under E. R. Gilliland. Data taken will also be correlated with other industry reports.

EDITORIALS

Rubber Program Enters Third Phase

EVENTS move very rapidly these days, but in all probability the pace will become more rather than less rapid during the next several months. Announcing on July 25 that the main task of the Office of the Rubber Director, that of creating a synthetic rubber industry of sufficient magnitude to make the United States independent of imports from foreign countries, was accomplished, Bradley Dewey, the Rubber Director, submitted his resignation and recommended that the Office of the Rubber Director be abolished and that its remaining duties be given to a Rubber Division in the War Production Board. It was made known during July that our State Department, which in June announced the formation of a combined industry-government advisory panel, had accepted an invitation to meet with the British and Dutch in London some time within the next few weeks to discuss postwar rubber problems.

It becomes apparent, then, that the rubber program is about to enter its third phase, that of effectively using the new volumes of synthetic rubbers that have been provided for the prosecution of the war to final and complete victory and of planning on a basis of world cooperation for production and use of a greater volume of rubbers, both natural and synthetic, than has ever before been available. In the first case, except for the present problem of increasing heavy-duty tire production, which seems to be mostly a question of obtaining adequate manpower, the use of synthetic rubbers during the remainder of the war period can undoubtedly be handled just as well by a smaller staff in a division of the War Production Board, and the Rubber Director should be complimented for being the first war agency head to recommend the elimination of his separate office and the continuation of its final war and postwar activities by the over-all parent agency. Provisions for research and improvement of the government's synthetic rubber processes and products have been made, and the objects of such research have been clearly defined, and the organization and policies therefore well set and functioning, the Rubber Director reported. It is also well known that many rubber companies, both large and small, are carrying out extensive researches either independently or in cooperation with the government, and the stage is now set for a decision in the near future as to whether the rubber industry as a whole feels that there is a part of the field of research in rubber best undertaken by a central laboratory, financed and managed by government and industry, or whether the rubber industry prefers to conduct all research, privately and independently in spite of the obvious duplication of effort that has and then will continue to take place. The view has been expressed previously in these columns and elsewhere that the rubber industry has an opportunity which is not likely to present itself again in the near future of continuing a research program that has been carefully organized and well executed, upon the dissolution of the Office of the Rubber Director and what will now be the Rubber Division of the WPB. It is sincerely hoped that some arrangement can be worked out whereby the majority of the companies in the rubber industry, both large and small, can agree upon and take the responsibility for the continuation and financing of a centralized program of fundamental research on rubber, before the government's program, plants, and research efforts are abandoned or their disposition left to the widely divergent views of the various members of the industry.

With respect to the problem of world cooperation in the field of production and consumption of rubber, it appears quite possible that cooperation between the various producing and consuming countries will be more extensive than ever before, but in order that we may have the proper perspective with which to analyze the results of any present or future discussions on the subject, the following essential facts are emphasized. First, the United States is now and may continue for some time to be the major producer of synthetic rubbers and the major consumer of rubber of all kinds. Second, by maintaining an adequate volume of synthetic rubber production in this country our national security can never again be threatened because of a shortage of this essential raw material the way it was in the early part of 1942. Third, after several decades of rubber manufacturing during which the price of rubber was allowed or forced to range from 3¢ to $1.23 a pound, a good-sized synthetic rubber industry in this country will mean that a much more stable price for all rubber may now be counted upon. Finally, although the synthetic rubber producing industry does not provide employment for more than 20,000 workers in this country at the present time, a considerable field for postwar employment is possible in the industries supplying the synthetic rubber industry, and what is of greater importance, if both synthetic and natural rubbers are available in generous volume and at a low and reasonably stable cost, employment in the rubber goods industry will be at new high levels, and the return to stockholders, management, and labor will continue to be exceedingly satisfactory.

International cooperation in the postwar world will and should be as complete as possible in order that everything conceivable and practical may be done to prevent economic and social conditions from developing that will lead to future wars, but in such cooperation all the parties concerned must be first of all in complete agreement on the reasons and objectives for the cooperation and then be willing to give as well as receive benefits in proportion to their contribution toward a common goal. The United States has already given much in order to obtain for the United Nations in an almost unbelievably short time independence and security in rubber supply. It would seem, therefore, to follow that the United States should receive a considerable return in the form of easily available and low-cost rubber produced outside of the United States, not only in the immediate postwar years, but for many years thereafter if a stable rubber market is to be achieved.

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Tensile tests on a Statex-93—GR-S tread compound at room temperature show results such as would be expected with carbon of six-acre surface. Values are approximately 80% of those developed by the same loading of Micronex in GR-S.

Tested at higher temperatures similar to those developed in road service, tensile figures for Statex-93 treads are substantially the same as for Micronex treads. Tests at 220° F show full equivalence between Statex-93 and EPC type channel carbon.

When specimens are subjected to flexing prior to testing another striking characteristic of Statex-93 is revealed — tensile does not fall off as rapidly as in the case of compounds containing channel carbons.

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Scientific and Technical Activities

Division of High Polymer Physics, A. P. S., Holds Inaugural Meeting

THE Division of High Polymer Physics of the American Physical Society, which has been in the process of organization for the past eight months, held its inaugural meeting in connection with the regular meeting of the Society at the University of Rochester, Rochester, N. Y., on June 23 and 24. A program of 22 papers dealing with experimental and theoretical physical investigations of rubbers, textiles, plastics, and high polymer materials in general were presented.

Business Meeting and Election of Officers

A business session was held in the course of the meeting, and the by-laws of the Division, as prepared by an organizing committee working closely with the A. P. S. council, were acted on favorably.

At the close of the meeting, the executive committee of the division, appointed by the A. P. S. council for the remainder of 1944, elected as officers of the Division: J. H. Dillon, Firestone Tire & Rubber Co., chairman; P. Debeye, Cornell University, vice chairman; W. James Lyons, Southern Regional Laboratory, Department of Agriculture, secretary; and L. A. Wood, National Bureau of Standards, treasurer. Other members of the executive committee include W. F. Busse, General Aniline & Film Corp.; R. Bowling Barnes, American Cyanamid Co.; and J. P. Elting, Kendall Mills.

Abstracts of Papers Presented

The abstracts of papers considered to be of special interest to the rubber industry are given below. Publication of all of the papers presented will take place in a single issue of the *Journal of Applied Physics* in the near future.

Systems with Superposed Viscous and Elastic Behavior. A brief summary of the historical aspects of this subject were given. The contributions of Maxwell, Voigt, Boltzmann, and other classical authors were related to the recent work of Kuhn, Bennewitz, Simha, Leaderman, etc. It was pointed out that the classical "theory" is mainly a formalism. Non-Newtonian flow behavior, high elasticity, and other important phenomena are not even considered in the classical theory. Recent work has been concerned with attempts to find the underlying basis of the classical formalism in terms of theories of molecular structure.

The remainder of the paper was devoted to a description of some theoretical researches on the molecular basis of elastic-viscous behavior developed at Princeton, and to the results of joint experimental-theoretical researches undertaken by the Firestone Tire & Rubber Co. and Princeton University. A molecular theory for a "unit process of deformation" was presented which describes the behavior of such a unit under the action of a local stress. The problem of combining the behavior of these deformation units was considered for the case of polymeric substances, particularly three-dimensional polymers. The network structure of these substances and the nature of the network junctures were emphasized. The theory of rubber-like elasticity and its relation to network structure were considered. The three characteristic regions of stress-time behavior in vulcanized elastomers were related to their characteristic structural features.

Five general classes of rheological experiments were described: plastometry, relaxation of stress at constant extension, creep under constant load or constant stress, breaking experiments, and vibration experiments. Plastometric experiments (in machines as Mooney or Dillon plastometers) provide the most striking example of non-Newtonian behavior. Application of the theories developed are only partially successful for quantitative description of the phenomena. The underlying experimental and theoretical difficulties were examined. Application of the generalized relaxation theory to rubbers (and many other substances) in the range of rubbery elasticity is again only partially successful. Part of the difficulty lies in obtaining uniform data that cover a wide frequency range. Experiments on relaxation of stress at constant elongation have proved very fruitful from both the experimental and theoretical point of view. Important additions to our knowledge of all three stress-time-temperature regions are indicated.

A discussion of the region of chemical destruction of the primary bond network in terms of chain scission and cross-linking were presented. Data on continuous and intermittent stress relaxation were interpreted quantitatively. Similarly the region of secondary bond relaxation and the region of relative thermodynamic equilibrium were described. Data on continuous and intermittent creep were shown to yield much the same information as data on continuous and intermittent stress relaxation. Certain other experiments which correlate with the results of creep and relaxation data were explained. A. V. Tobolsky, Princeton University, Princeton, N. J.

A Molecular Theory of the Viscoelastic Behavior of an Amorphous Linear Polymer. The kinetic theory of rubber elasticity is extended in two respects. First, the distribution of relative displacements of every chain atom is considered, not merely the distribution of relative chain-end displacements. Second, the rate of approach to elastic equilibrium, as well as the equilibrium itself, is considered. As a first approximation, it is predicted that a linear amorphous polymer will possess a distribution of elastic retardation times of the form $J(T)\,dT = \frac{(C + D \ln T)}{T}\,dT$, where C and D are constants characteristic of the material. T. Alfrey, Monsanto Chemical Co., Springfield, Mass.

Retraction of Stressed Rubber. The process of the retraction of stressed rubber has been studied using several experimental methods. The most promising method employed was the use of a smoked revolving drum driven by a synchronous motor. A light stylus was fastened to the free end (or any position behind the tip) of a rubber sample; the other end of the sample was clamped. The elongation-time curves were recorded accurately and directly on the drum by the stylus. From these curves the velocity of the tip, as a function of elongation (or time), may be obtained by differentiation. For about 450% initial elongation a tip velocity higher than 220 miles/hour was derived. The velocity of the tip is sensibly constant, except for the initial acceleration at the beginning of the retraction. This initial increase is due to the weight of the stylus and of the rubber in the grip (before the sample is released).

A two-stylus experiment (one at the tip, the other at the middle), showed clearly the lag of the middle behind the tip and hence the nature of the retraction. The middle moves only slightly slower than the tip. For a Butyl tread stock the elongation-time curve for the tip has an exponential tail. The lag of the middle behind the tip is much smaller. The velocity of the middle point is also considerably smaller than that of the tip. The velocity of each section of the sample appears to be proportional to the distance from the fixed end. *Hevea* gum and Butyl tread are the two extremes. *Hevea* tread, GR-S gum and tread, and Butyl gum were found to show an intermediate behavior.

The element by element contraction of rubber was checked by high-speed instantaneous photos and movies. They show clearly a well-defined wave pulse progressing along the sample. They also check the timing. The duration of the retraction is for about 100% initial elongation: 5-20 milliseconds according to the particular sample used. B. A. Mrowca, C.S.C., S. L. Dart, and E. Guth, University of Notre Dame, Notre Dame, Ind.

Electrostatic Properties of Rubber and GR-S. A new "electrostatic modulator" for measuring the electrostatic charges on various materials is described. In this apparatus the electrostatic lines of force established between the charged specimen and the grid of an audio-frequency amplifier are cut or modulated at audio frequency by a motor-driven fan. The resultant alternating current voltage is amplified and measured on a meter in the output circuit. This device, in conjunction with a mirror-surfaced metal plunger system for contacting the sample, has been used to measure the contact potential of various rubber and GR-S compounds. Data are shown on both rubber and GR-S compounds, and they bear out the formulation of an "electrostatic contact potential theory of reenforcement", in which reenforcement is explained on the basis of contact potentials, and resultant electrostatic forces set up between the rubber and the reenforcing agents. By the application of this theory, organic materials, which have a highly positive charge, such as polymerized trimethyldihydroquinoline and Flectol H, have been found to increase the tensile of GR-S pure-gum-type compounds as much as fivefold and nearly to double the tensile of high zinc oxide GR-S compounds. R. S. Havenhill, R. C. O'Brien, and J. J. Rankin, St. Joseph Lead Co., Josephtown, Pa.

Speed of Retraction of Rubber. A method of measuring the speed of retraction of rubber is described which utilizes an electronic timing circuit with photocell input. The results include measurements of the speed of retraction of *Hevea* and synthetic rubbers as a function of elongation, temperature, carbon black loading, and cure. They are discussed both from the standpoint of the new information which they give in regard to rubber structure and high elasticity

as well as their practical application to evaluate quality and cure. High-speed photographs of interest in showing how rubber retracts are included. R. B. Stambaugh, M. Rohner, and S. D. Gehman, Goodyear Research Laboratories, Akron, O.

Rise of Temperature on Fast Stretching of Butyl Rubber. In contrast to *Hevea* gum, Butyl gum crystallizes on stretching at much higher extensions and much more abruptly. The progress of crystallization was followed by measuring the rise in temperature on fast stretching. The rise in temperature increases first slowly with extension, but shows a steep upward turn after the onset of crystallization. For 900% extension a temperature rise of over 10° C. was recorded, compared with 10-15° C. rise for *Hevea* gum stocks of various compositions. For Butyl tread the rise in temperature increases somewhat steeper right from the beginning owing to the earlier crystallization of the tread stock. In general more similarity exists between Butyl and *Hevea* tread than between the corresponding gum stocks. The cooling on retraction (after the sample was kept extended one minute) and the residual rise in temperature after extension and immediate retraction were also observed. The initial small cooling (0.001° C.) at very low extensions was recorded by using a sensitive galvanometer. The large heat effect at crystallization was measured using a galvanometer with a period less than 0.1 second. Based on these measurements, a new method was introduced to resolve the stress into its components due to internal energy an entropy respectively. S. L. Dart and E. Guth.

Limiting Law of the Reenforcement of Rubber. The effect of the filler upon the modulus of compounded rubber has been calculated with the aid of some simplifying assumptions. From these calculations it is found that the increase in modulus, due to the filler, is directly proportional to the volume loading and is independent of the particle size of the filler. The stress system in the vicinity of a spherical filler particle has also been calculated. A series of experiments has been made to check these calculations. From the results of these experiments, it has been deduced that carbon black is flocculated in rubber; and that P-33, Thermax, and Gilder's whiting are completely dispersed in rubber. These last-named fillers give increases in modulus substantially in agreement with the calculations. It has further been found that Kadox and XX zinc oxide give unusually large increases in modulus. These are ascribed to alteration of the type of cure of the rubber matrix. Catalpo clay showed excessive modulus because of high calender grain. H. M. Smallwood, United States Rubber Co., Passaic, N. J.

Relations between Stress, Strain, and Temperature in a Pure-Gum Vulcanizate of GR-S. Stress-temperature relations at constant elongation and at constant length have been studied in a pure gum vulcanizate of GR-S. Such studies yield information useful for calculations involved in the theory of its elastic behavior and furnish practical data regarding its tensile properties at different temperatures. The compounding recipe was: 100 parts by weight of GR-S, two parts of sulphur, one part of zinc oxide, and 0.5-part of zinc dibutyl dithiocarbamate. To minimize the effects of relaxation of stress during the observation of stress-temperature relations, the specimens were first held at constant length and constant temperature for one or two hours to allow the stress to approach a constant value. These values of stress were used to plot a stress-strain curve. The stress-temperature relations observed for temperatures below the relaxation temperature were linear and reproducible on successive runs of increasing and decreasing temperature. When the temperature was raised above the relaxation temperature, straight lines were not obtained since further relaxation occurred at the higher temperatures.

The intercepts at the absolute zero of temperature for the lines obtained below the temperature of relaxation are useful in evaluating the internal energy changes. The intercepts of the lines representing the experiments at constant elongation were found negative. The absolute values were of the order of 20% of the total stress for elongations up to 100%, and increased to about 30% of the stress at the highest elongation, about 150%. F. L. Roth and L. A. Wood, National Bureau of Standards, Washington, D. C.

Some Low-Temperature Properties of Elastomers. A modification of the apparatus employed in measuring the Young's modulus of elastomers at low temperature is described. The changes made in the apparatus permit the use of a simplified technique which can be adapted to routine testing procedure.

The effects of various softeners on the low-temperature bending moduli and the brittle point temperatures of stocks based on four butadiene-acrylonitrile (B/A) type copolymers are given. It is shown that the softeners tested have the same relative effects in all four types and that a wide variation in low-temperature properties is imparted to the stocks by the different softeners.

Bending modulus curves and brittle point temperatures are given for typical test stocks based on "Thiokol" FA, and "mass" and "emulsion" polymerized polybutadiene. It is shown that continued exposure to low temperature affects the Young's modulus of some, but not all typical vulcanizates. Data are presented showing this effect on an uncured *Hevea* gum stock held at 0° C. Certain softeners have been found to induce time effects in one of the B/A type stocks, which exhibits no crystallization and, hence, no progressive stiffening in the absence of the given softeners.

A method for measuring and evaluating creep under dead load at low temperatures is presented. Accompanying data indicate that in the case of those stocks tested the creep constant defined reaches a maximum at a definite temperature which is a characteristic of the given stock. F. S. Conant and J. W. Liska, Firestone Tire & Rubber Co., Akron.

Some Physical Properties of Elastomers at Low Temperatures. The extreme importance of choosing testing conditions to be comparable with the service expected of an elastomer is discussed from the physical point of view. The shapes of the modulus *vs.* temperature curve are interpreted on the basis of the non-equilibrium nature of the elastomer properties in the transition region between the elastic and the glassy states. Variations in the physical properties caused by changes in testing speed, sample shape, stress at which the modulus is calculated, and previous history of the sample are discussed. For a specific set of testing conditions typical data are given for the elastic modulus, hysteresis, and set as a function of temperature for natural rubber, GR-S, polybutadiene, Butyl, and Neoprene FR. Examples are cited from a study of various softeners and loadings which show the influence of compounding ingredients on the rate of attaining equilibrium between stress and strain in the transition region. A few examples are given to show the effect of changes in the polymer molecule.

Simple and inexpensive testing methods are presented which permit a relatively rapid determination of the low-temperature properties of rubber-like materials in tension. A detailed description of a small, low inertia tensile machine capable of recording both stress and strain from a single cable is given. H. E. Greene, C. W. Harris, and D. L. Loughborough, B. F. Goodrich Co., Akron.

Molecular Weight Studies of Some High Polymers. A number of high polymers such as proteins, cellulose, cellulose acetate, rubber, gutta percha, polystyrene and polyvinyl chloride were investigated by various methods such as osmotic measurements (static and dynamic), viscosity determinations, ultra-centrifuge runs, and light scattering observations. Thus far the following results have been obtained.

(1) In the case of fractions, the molecular weights determined by the various methods checked within the limits of error of the experiments. Considering that different averages are observed by the different procedures, this may be taken as an indication that the fractions are fairly narrow. (2) The influence of concentration on such quantities as reduced osmotic pressure, specific viscosity divided by concentration and concentration divided by turbidity provides interesting means of studying the solubility characteristics of the dissolved polymer, and eventually may lead to conclusions about the average shape of the macromolecules in extremely dilute solutions. P. M. Doty, B. H. Zimm, and H. Mark, Polytechnic Institute of Brooklyn, Brooklyn, N. Y.

Factors Influencing the Brittle Point of High Polymers. Most of the brittle point tests in current use may be characterized as requiring a certain amount of deformation of the sample in a fixed time interval. Three mechanisms may supply this deformation: (1) ordinary elasticity, which makes a small contribution, (2) high, or rubber-like, elasticity, and (3) viscous flow. The brittle point test can be analyzed in terms of these three mechanisms, and the following definition of brittle point was arrived at: the brittle temperature is that temperature at which the time interval necessary to produce the required deformation is just equal to the time interval allowed by the test. From the consideration of this definition it was seen that requiring more deformation, or allowing less time, will raise the brittle temperature, which has been found to be true. A semi-quantitative treatment of the effect on brittle temperature of variations in molecular weight was made with the aid of the Flory melt-viscosity equation, which treatment showed that a linear relation existed between the square root of the molecular weight and the reciprocal of the brittle temperature. A similar treatment of the effect of added plasticizer showed that a linear relation existed between the square root of the weight fraction of polymer and the reciprocal of the brittle temperature. Both these predictions were confirmed experimentally. R. S. Spencer and R. F. Boyer, Dow Chemical Co., Midland, Mich.

Thermodynamics of Rubber at Low Extentions. On analyzing their own data, Meyer and Ferri have concluded that at small extentions rubber is an ideal elastomer according to the definition that the partial derivative of the intrinsic energy with re-

spect to the length, at constant pressure and temperature, vanishes. Further analysis of Meyer and Ferri's data does not sustain their conclusions. If, however, the relation—the partial derivative of the intrinsic energy with respect to the length, at constant temperature and volume vanishes—is taken as a new criterion for an ideal elastomer, Meyer and Ferri's data do indicate that rubber is ideal, at least for extensions up to 166%. The new criterion implies that the valence angles do not store an appreciable amount of energy when the rubber is stretched. However both the molecular orientation and the interatomic displacements do influence the energy required for extension. D. R. Elliott and S. A. Lippman, U. S. Rubber, Detroit, Mich.

Transition Phenomena in High Polymers. Organic polymers of high molecular weight exhibit a variety of changes in state, which profoundly affect their physical and mechanical properties and are thus of both theoretical and practical interest. Temperature and external stress are, as expected, the principal determinants of these transitions. Because van der Waals' forces are of relatively short range compared to metallic or ionic bonds, delicate and subtle changes in structure govern the physical behavior of natural and synthetic high polymers.

I. "Second Order" Transitions. The most general transition of essentially linear macromolecules (with which we are chiefly concerned) is between high elasticity and ordinary elasticity; room temperature is above this transition point for rubber, but is below it for polystyrene. These changes in state occur unsharply, as evidenced by changes in slope, but not as discontinuities in the curves of specific heat, coefficient of thermal expansion, dielectric constant, modulus of "elasticity", etc. *vs.* temperature. They have been associated for the past decade with the "second order" transitions of P. Ehrenfest.[1] Indeed, the temperatures at which they apparently occur are greatly influenced in high polymers by the speed of the experiment; that is, it seems that in the range of some of these transitions the relaxation time of the polymer compares with the time required for the observation. A great deal of their quantitative interpretation remains to be done. For instance, evaluation of the relative importance of forces between molecules compared to those within molecules (rotations around primary valence bonds) in restricting rotational motion in the polymer chains below these transitions is unsolved. Nevertheless onset of rotational motion of chain segments (about their long axes) as the temperature is raised through the transition range is a likely deduction from many experiments. Relatively small changes in chemical composition (but presumably large alterations in van der Waals' forces) can shift the temperature range of this transition from -80° C. (polybutadiene, polyisobutylene, natural rubber) to over 100° C. (cellulosic materials; thermoset polymers like phenolics).

II. Transitions with Latent Heat; First Order Types. A great many high polymers possess such geometrical regularity that at least portions of their long chains form ordered, crystal-like arrangements spontaneously above room temperature (polyethylene, polyesters, polyvinylidene chloride), or especially under particular conditions of cooling or annealing (polyamides, cellulose esters). Others undergo such ordering at lower temperatures (natural rubber). Some polymers "crystallize" under external stress such as stretching, at higher temperatures than those at which they order spontaneously (natural rubber), or only under stress, and not spontaneously at any temperature (polyisobutylene). Many of these transitions, which X-ray and electron diffraction show to involve quite sharp changes in local order, have lately been found to possess high latent heats, or apparent discontinuities in heat content-temperature curves. They resemble first order transitions and are strikingly abrupt considering the great range of molecular weights, and, presumably, of overall chain configurations, contained in the polydisperse samples investigated. The low temperature (or ordered) side of these first order transitions is distinguished by the strongest molecular interaction of any state of the polymer. Indeed, the molecular packing appears often to be so efficient that characteristic high polymeric strength and toughness are attained at one-tenth the average molecular weight of similar molecular structures which do not show such first order transformations (polyethylene, ordered, compared to polystyrene, disordered). Recent studies on simple condensation polymers suggest that either the regular occurrence of points of strong van der Waals' attraction along a given chain (polyvinyl alcohol, polyamides, polyesters, cellulose triesters, etc.) or such composition that the chain has a sort of rod-like, cylindrical symmetry around its axis (polyethylene, polyvinylidene chloride, polyisobutylene) is necessary for transformation to states of high local order. Thus, while virtually all chain polymers may show the "second order" transitions first noted, only those of requisite structure can exhibit "first order" phenomena.

III. Mixed Transition Phenomena. Transitions or structure changes within phases defined by the prime transformation with latent heat of "crystal-liquid" nature have now also been reported. These transitions, within the ordered state, caused by temperature alone may be of second order, although this is not yet certain. Those associated with both temperature and external stress are still more specialized, as illustrated by the α-β keratin transition and the recent analogy to it produced with synthetic substituted polyamides. These instances appear also to be related to understanding of the α and β forms of gutta percha, wherein the transition seems to involve change in chain configuration by twisting about primary valence bonds (not to be confused with actual oscillations about such bonds, as on the high temperature side of a "second-order" transition).

IV. Present Status of Study of Transitions. Accurate observations and conceptions of the basic structures and free energies concerned comprise the present study of transition phenomena in plastics. Attempts at detailed theories do not yet justify review. Evidently transition temperatures influence greatly the particular utility of high polymers in the form of rubbers, plastics, or fibers. (Perhaps astrophysicists realize that rubber tires are not flexible on cold planets, while bomber noses would stretch like balloons in worlds above 100° C.) Problems like the insolubility at room temperature of simple polymers such as polyethylene and polyvinylidene chloride have been enlightened by evidence that these substances gain sufficient rotational entropy in the solid to make dissolution thermodynamically unattractive. On the other hand the decrease in entropy caused by orientation (fibering) of an already ordered polymer seems to be too slight to entitle orientation *per se* to classification as a separate state. Perhaps transition phenomena in high polymers are best summarized as being highly probable events, for actually a given polymer solid usually contains several states of order simultaneously, never being all ordered, or entirely disordered, and these states are likely to be changing slowly, but more or less continuously, much like the legendary changes in ancient glass. Thus, like this discourse, they are physically very imperfect phases indeed. W. O. Baker, Bell Telephone Laboratories.

Theory of Filler Reenforcement. For small loadings (up to about 10% volume parts) the colloidal carbon black spheres may be considered as suspended in a continuous rubber matrix. This "model" was first used by J. Rehner, Jr. The authors generalized this model for ellipsoidal (including plate- and rod-like) filler particles and extended it to the computation of various properties of the mixture in terms of the properties of the matrix and of the fillers. Viscosity, Young's modulus, and dielectric constant of the mixtures were derived as linear functions of the volume concentration for small, and as quadratic functions for higher loadings. For small loadings the tensile strength first decreases because of the stress concentrations occurring around the carbon black spheres when the samples are stretched. The increase of the tensile observed for greater loadings is due to the tendency of carbon black spheres to form stains and finally a type of network.[2] The stiffness increases with loading, up to the concentration where the mixture becomes a dilution of carbon black by rubber. There the tensile decreases too. Binding of rubber by the black (Fielding, Wiegand) is similar to solvation. The model was checked on the rubber-calcium carbonate system and to a certain extent on the rubber-carbon black system. The theory is very similar to the theory of Einstein on the viscosity of colloidal solutions and Maxwell's work on dielectric properties. E. Guth, University of Notre Dame, and H. M. James, Purdue University, West Lafayette, Ind.

Control of Elongation in Highly Stretched Cotton Tire Cord. At present almost all cotton tire cord is subjected to some stretching treatment to improve its strength and stretch characteristics. However it has not been possible to take full advantage of the maximum potential strength obtainable by stretching treatments because they reduce the elongation to an extremely low value. Tires made from such low-stretch tire cord have low impact strength; while tire cord with too much stretch leads to tire growth. Therefore a compromise had to be made between strength and elongation, sacrificing part of the maximum strength. This paper describes a new dual-stretching process which allows the control of elongation of cotton tire cord independently of the strength and permits the production of a cord which combines almost maximum strength with optimum elongation. The method consists of two steps. During the first step the cord is given increased strength by simultaneous application of tension, moisture, and heat. During the second step the elongation is adjusted to the desired value by the application of moisture and tension without heat. The degree of swelling and of stretching during the second phase determines the elongation of the improved tire cord. H. J. Philipp and C. M. Conrad, Southern Regional Research Laboratory, New Orleans, La.

Comparison of the Structures of

[1] Perhaps these transitions should be called "higher order" or "Ehrenfest" transitions, since they include "anamolous first order", "diffuse", "lamba", as well as "simple second order", to follow the classification of Mayer and Streeter, *J. Chem. Phys.*, 7, 1019 (1939).

[2] Cf. G. Goldfinger and W. R. Smith, paper at New York meeting, Rubber Division, A. C. S., 1944.

Stretched Linear Polymers. Published X-ray data from crystalline selenium and tellurium and from stretched sulphur (amorphous), polyethylene, polyisobutylene, polyvinyl alcohol, polyvinyl chloride, polyvinylidine chloride, polyoxymethylene, polyoxyethylene, polyethylene disulphide, polyethylene tetrasulphide, and polyphosphonitrile chloride are compared. In most cases the experimental identity distance in the direction of the chain axes and the expected interatomic distances and interbond angles are found to be in agreement with the assumption that the chain atoms form a regular spiral, unidirectional in each chain and of uniform pitch. Apparent exceptions are briefly discussed. M. L. Huggins, Eastman Kodak Co., Rochester, N. Y.

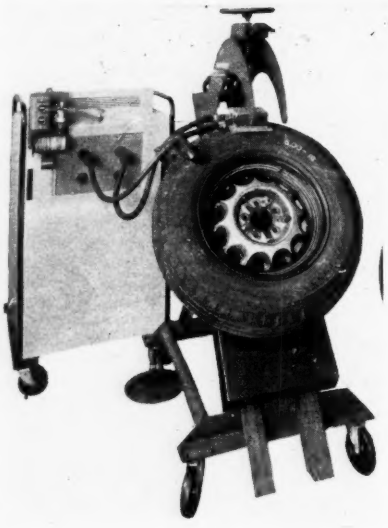
Synthetic Tires and New Vulcanization Method Discussed

THE national transportation and maintenance meeting of the Society of Automotive Engineers, Inc., was held June 28 and 29 at the Bellevue-Stratford Hotel, Philadelphia, Pa. About 500 members and guests attended the sessions on sludge, cooling, postwar trucks, and tires.

J. E. Hale, Firestone Tire & Rubber Co., in a paper, "What Truck and Bus Operators Should Know about Synthetic Tires", predicted that the current tire shortage for commercial vehicles will be offset by growing production of increasingly satisfactory synthetic tires which will give good service, but which will demand better care, reduced loads, and curtailed vehicle operating speeds in warm weather. The huge manufacturing capacity created for the war effort after victory will produce synthetic tires low in price, adequate in quantity, and superior in quality, he said. Given two to four years and an opportunity to work on technical developments, Mr. Hale added, "we will be able to produce tires of even better qualities and characteristics than we have been able to make with synthetic rubber." Although postwar tire developments will be affected by economical, technical, and political factors, producers of synthetics will be able to get prices down to a figure characterized as "very attractive" despite the possibility of a 10¢ a pound delivery price for natural rubber, according to Mr. Hale. He also described government attitude, tariffs, and political viewpoints as critical unknowns. His talk emphasized the superiority of rayon cord for synthetic tire construction and suggested the following approximate speed limits for synthetic tires on commercial vehicles in order to preserve the bodies of tires for retreading.

Atmospheric Temperature ° F.	Average Cruising Speeds M. P. H.	Maximum Speed for Short Distances M. P. H.
Under 40	40	50
40 to 80	35	45
Over 80	30	40

Development of a tire-vulcanizing device employing electronic principles was described in a paper, "Employment of Electronics for Effecting Tire Vulcanization", by Lt. Col. C. W. Vogt, chief, technical staff for supply, Transportation Corps, U. S. Army. The device, consisting of a press ram equipped with an electrode coupled to a high-frequency generator, and a press frame, applies "internal heat" to make spot and sectional cures in about 17 minutes for the 6.00 by 16 size. The ram and frame, fitted with filler bags which adjust themselves under pressure to tire contours, obviate the use of molds, effect repairs on 6.00- to 14.00-size tires, and eliminate current vulcanizing hazards such as destructive overheating of adjacent sections. Colonel Vogt's invention is now in use by the Army under front-line combat conditions. The 500-pound mobile military unit which occupies no more than a dozen square feet of space is replacing much heavier Army tire-repair equipment which takes hours to operate. Tests were said to indicate the possibility of utilizing the principles of the device after the war both for recapping and for new tire production operations.



Tire Vulcanized by Electronics Device

A. S. M. E. Rubber and Plastics Division Meets

THE Rubber and Plastics Division of the American Society of Mechanical Engineers held two technical sessions in Pittsburgh, Pa., at the Hotel William Penn on June 22 in connection with the semi-annual meeting of the parent society. The morning session, held as a joint meeting of the Aviation and Rubber and Plastics Divisions, was presided over by James H. Booth, of Thompson Products, Inc., Detroit, Mich., and the afternoon session of the Rubber and Plastics Division was presided over by E. Gray King, of the Mellon Institute of Industrial Research, Pittsburgh.

The first paper of the morning was given by A. C. Titus, of General Electric Co., of Schenectady, N. Y., on "The Effect of High Relative Humidities in Producing Changes in Dimension of Plastics." In this paper it was stated that dimensional changes due to moisture absorption in laminated plastic products are closely related to the type of filler employed. Much greater expansion from the dried state is found in cotton cloth than in asbestos or glass-cloth filled laminated materials, which is due to greater absorption within the cotton fibers. The dimensional change is related to changes of relative humidity. Cotton-rag filled phenolic molded plastic instrument bases could be dehydrated in the oven at 150° C. within 24 hours, but required more than seven times as long at 80° C. Continual shrinkage occurred beyond the dry state at either temperature. No upper limit was even approached in two months at 100% humidity.

The next and final paper in this session was given by T. R. Thoren, of Thompson Products, who spoke on "The Use of Rubber and Synthetics for Sealing Aviation Fuel System Equipment." Some interesting facts concerning the development, design, and testing work done in providing satisfactory seals in aviation fuel system equipment, such as fuel booster pumps, selector cocks, and engine driven pumps, were presented. Although the introduction of aromatic blended aviation fuels and the requirement that military aircraft be capable of satisfactory operation at temperatures down to —65° F. have made it necessary to alter some of the seals both in the rubber composition and in design, synthetic rubber parts and materials containing synthetic rubber have provided a convenient and satisfactory solution to the problem of sealing fuel system equipment, it was reported. A wide variety of properties are available in synthetic rubbers, but the best physical form of a synthetic rubber part to meet the specific requirements is arrived at by making provision in the design for the limitations of the rubber stocks available. It was emphasized that once the design is set and a specific rubber stock selected, close control of the production quantities is necessary to assure consistent performance.

The first paper of the afternoon session was T. S. Lawton, T. S. Carswell, and H. K. Nason, of Monsanto Chemical Co., Springfield, Mass., on the "Effect of Environmental Conditions on the Mechanical Properties of Cellulose Acetate and Cellulose Nitrate Plastic Sheets." The effect of ambient temperature, relative humidity, testing speed and sheet thickness on the tensile properties, and of temperature on the compressive, flexural, shear, and impact properties of cellulose acetate and cellulose nitrate plastics sheets was shown in detail, and the general nature of these effects summarized.

The next paper was given by E. G. Kimmich, of the Goodyear Tire & Rubber Co., Akron, O., on "Mechanical Rubber Goods as Used on Modern Aircraft." The successful conversion to synthetic rubber was reported for all rubber parts used in aircraft of the present day except for engine and instrument mountings. Engine mounts may soon be converted to synthetic rubber as a result of laboratory and field work now being done, but instrument mounts may not be converted for some time because of the difficulty in obtaining the necessary low temperature characteristics with synthetic rubber for this application. Many illustrations of the use of synthetic rubber in bullet-sealing tanks and hose, hydraulic lines, bellows, fuel tank fittings, and various molded products were shown. Rubber forming pads, as used in the airplane industry for shaping thin metal parts, were mentioned.

The final paper, by H. C. Guhl, of Westinghouse Electric & Mfg. Co., Trafford, Pa., dealt with "Hot Forming of Phenolic Laminates." Flow charts were used to describe the various laminating processes, and photographs and samples of typical laminations were exhibited. Data on heat discoloration and hardness were included in the talk.

Industrial and War Problems Discussed at A.S.T.M. Meeting

THE forty-seventh annual meeting of the American Society for Testing Materials, June 26 to 30, at the Waldort-Astoria Hotel, New York, N. Y., convened in 16 formal technical sessions and more than 250 meetings of the Society's technical committees, and was attended by 2,063 members and guests. The record-breaking registration exceeded by more than 35% the previous high recorded in New York in 1937. One hundred technical papers and reports were presented. More than 55 new tentative standards were accepted for publication for the first time, and 70 specifications were proposed for adoption as formal A.S.T.M. standards. Standards work has been intensified by the various committees because of the advancement by a full year of publication of the Society's "Book of Standards", which will be issued this year.

Committee D-16 on Industrial Aromatic Hydrocarbons, organized October 26, 1943, reported that its various subcommittees had prepared specifications for various solvents and aromatic chemicals including benzene and toluene. Other subcommittees have been studying and developing methods of sampling and various methods of tests.

Committee D-13 on Textile Materials reported that its subcommittee on tire fabrics is engaged in studying rayon cord fatigue testing, and modifications of present methods of testing cotton tire cord to make them applicable to the testing of rayon cord. A revision of the Standards Methods of Testing and Tolerances for Tire Cord, Woven and on Cones (D179-42), was recommended for publication as tentative.

Committee D-17 on Naval Stores offered Proposed Methods of Sampling and Testing Dipentene and Proposed Methods of Sampling and Testing Pine Oil for publication as information before being recommended for publication as tentative.

Committee D-20 on Plastics offered 12 new tentative standards. Important revisions in 12 other standards were approved by the Society. Proposed revisions of standards for plastics included Tentative Specifications for Nonrigid Vinyl Butyral Plastics (D745-43T), Tentative Specifications for Vinylidene Chloride Molding Compounds (D729-43T), Tentative Specifications for Ethyl Cellulose Molding Compounds, and Tentative Specifications for Nonrigid Ethyl Cellulose Plastics.

Two new tentative standards were approved by the Society as developed by Committee D-11 on Rubber Products. One gives specifications for cellular rubber products formulated by the special committee under the auspices of Army Ordnance. The material covered is of two types grouped as sponge, latex, foam, and expanded rubbers. The tests methods are covered in a previously issued Method of Testing Sponge Rubber Products (D552-43T) in which a number of revisions were accepted at the meeting. The committee changed the current title by substituting "cellular" for "sponge" to describe the scope more accurately. The procedure for measuring tensile strength and elongation was omitted as the committee thought these tests were of little value in evaluating this type of material. Additional procedures covering low-temperature testing, measurements of water absorption, evaluation of compression-set characteristics, and measurement of the effect of oil were included, as these tests are believed to be of importance in many of the applications of cellular rubber.

A new test for stiffening vulcanized elastomers at low temperatures, which was also approved by the A.S.T.M., was the result of intensive work by Subcommittee XXV on Low-Temperature Test for Rubber and Rubber-like Materials because of the inadequacy of the brittleness test that was a part of Standard D 736, previously approved. Young's modulus in bending is determined at low temperatures and used as a measure of the cold-stiffening characteristics of the material. Provision is made in the method for measuring the stiffening effect produced either by crystallization or by second order transition (vitrification), whichever is involved in the material being tested.

More than 100 persons attended the meeting of Committee D-11 on June 27, at which 16 subcommittees reported on accomplishments of the past year. Simon Collier, Johns-Manville Corp., was acting chairman. It was voted that Committee D-11 will meet with the Society at the regular spring meeting in Pittsburgh, Pa., in 1945. The committee decided to continue the use of the phrase "rubber and rubberlike materials" in the title and scope of the committee rather than the words "rubber and related materials" as recommended by the Society's executive committee. The following officers were elected: chairman, Mr. Collier; vice chairman, H. E. Outcault, St. Joseph Lead Co.; secretary, A. W. Carpenter, B. F. Goodrich Co.; advisory committee, L. V. Cooper, Firestone Tire & Rubber Co.; A. R. Kemp, Bell Telephone Laboratories; W. H. Juve, consulting technician; and T. A. Werkenthin, Bureau of Ships, Navy Department. Other actions included a vote to define and publish the scope of each subcommittee and to review the balance between consumers and producers on each subcommittee. Several revisions in tentative standards as recommended by the subcommittees were approved. The adoption as standard without revision of Tentative Methods of Test for Resistance to Light Checking and Cracking of Rubber Compounds (D518-38T) and for Tear Resistance of Vulcanized Rubber (D624-41T) was also approved.

Harold DeWitt Smith, of A. M. Tenney Associates, Inc., delivered the nineteenth Edgar Marburg Lecture. Speaking on "Textile Fibers—An Engineering Approach to an Understanding of Their Properties and Utilization," Dr. Smith stressed the new philosophy of textiles which has been created by the advent of manufactured fibers.

"The essence of this new philosophy is that fibers can be designed to meet specific textile wants rather than that textile wants must be designed to utilize immutable fiber 'personalities,'" Dr. Smith stated.

The only real limitation in the future, he said, on the variety and characteristics of textile fabrics will be the ability of the textile designer and technologist to help the fiber maker to understand what kinds of fibers are wanted. Physical tests for the evaluation of textile fabrics were described in detail by Dr. Smith.

"Minerals in War and Peace" was the subject of Charles K. Leith, minerals consultant, WPB, and professor of geology at the University of Wisconsin, at the A.S.T.M. general session. This speaker urged adoption of a sound national mineral policy to offset depletion of our mineral reserves, which is becoming serious from a long range point of view. Such a program, according to Dr. Leith, would involve developing a workable plan for equal access to the world's mineral supplies, the acquisition of stockpiles of strategic minerals in which the United States is deficient for protection against future emergency, and a policy aimed at improving big business controls rather than one of "setting the clock back" by attempts to retard the evolution toward large units of control. Zinc was among the minerals named by Dr. Leith upon which in the not too-far-distant future this country will have to depend on foreign supplies.

Dean Harvey, Westinghouse Electric & Manufacturing Co., chose as his subject for the annual presidential address "The Art of Being a Materials Engineer" and emphasized those characteristics which mark the successful materials engineer.

A.S.T.M. officers elected included: president, P. H. Bates, National Bureau of Standards, Washington, D. C.; and vice president, Mr. Carpenter.

Because some emergencies no longer exist all committees were urged to review emergency standards under their jurisdiction for revision or advancement to tentative or standard. After July, 1945, all emergency specifications must be approved annually by the A.S.T.M.

Rubber Reserve Co. Circular No. 28

UNDER date of June 9, 1944, the Rubber Reserve Co. issued Circular No. 28 on the "Distribution of Special Grades of GR-S." This circular states that special grades of GR-S are now being produced in certain government-owned copolymer plants operated for the account of Rubber Reserve and are now available for limited distribution to rubber manufacturing companies. These special grades have been assigned the following GR-S designations and are of the same type as standard GR-S except as indicated:

GR-S—12:
This grade has a Mooney viscosity between 63 and 75 (as compared with a Mooney viscosity for standard GR-S between 45 and 55) and tends to have a slightly higher modulus than standard GR-S.

GR-S—20:
This grade has a Mooney viscosity between 39 and 45 and has a lower modulus and higher elongation than standard GR-S.

GR-S—85:
This grade has a Mooney viscosity between 90 and 110 and has a considerably higher modulus and lower elongation than standard GR-S.

GR-S—St:
This grade is the same as standard GR-S and contains "Stalite" as the stabilizer.

Rubber Reserve will sell any of the special grades of GR-S at a price of 18½¢ a pound, plus a uniform freight charge of ½¢ a pound, all such sales to be made, freight allowed, ex the producing plant upon the terms and conditions set forth in Circular No. 17. Manufacturers wishing to purchase such special grades of GR-S should address appropriate requests to the sales department of the Rubber Reserve Co., as provided in its Circular No. 27.

The remainder of this Circular No. 28 refers to certificates required by Circulars Nos. 21 and 22 and also to Circular No. 23 regarding claims for quality and weight adjustments.

Photos by George W. Smith

Golf and Baseball Entertain Boston Group (*Left to Right*): C. W. Meyer, R. M. Leighton, Josiah Crosby, A. R. Lukens, Saul Palais, George Abbott, E. Zabrosky, H. T. Mason, E. Varnum, A. Greenbaum, G. Friedman

Boston Group Enjoys Outing

THE annual summer meeting of the Boston Rubber Group, held June 23 at the Woodland Country Club, Newton, Mass., was attended by 290 members and guests. The program, under the direction of C. E. Reynolds, Cambridge Rubber Co., and R. K. Patrick, Windram Mfg. Co., included a golf tournament, soft ball game, horseshoes, dart throwing, and cards. Edward Colligan directed the golf tournament. Winners were: kickers handicap, F. G. Shinick, E. V. Osberg, S. V. Sharen; low gross, E. B. Curtis, E. Colligan; low net, A. Greenbaum, W. Ritz, Charles Low; nearest pin, W. B. Richardson, M. E. Nourze; most 5's, H. C. Simonds; most 8's, R. E. McCurdy; high gross, L. B. Burnham. W. Lyman won the dart throwing contest. T. C. Ashley's "Bear Cats" won the ball game, 6-5, playing against L. G. Shaw's "Wild Cats." A lobster dinner was followed by group singing. Door prizes contributed by the following firms were distributed to all members and guests:

Acushnet Process Co., Akron Standard Mold Co., L. Albert & Son, Aluminum Flake Co., American Bleached Goods Co., American Cyanamid & Chemical Corp., American Mineral Spirits Co., American Resinous Chemical Co., American Zinc Sales Co., Inc., Anaconda Sales Co., Angier Products Co., Archer Rubber Co., T. C. Ashley & Co., Atlantic Refining Co., Avon Sole Co., Baldwin Locomotive Works, Barrett Division of Allied Chemical & Dye Corp., Binney & Smith Co., Boston Woven Hose & Rubber Co., Brockton Machine Co., Brooklyn Color Works, Bunatak Chemical Co., Godfrey L. Cabot, Inc., Calco Chemical Division, Chemical Pigment Co., Callaway Mills, Cambridge Rubber Co., Carbide & Carbon Chemicals Corp., C. F. Church Mfg. Co., Cleveland Liner & Mfg. Co., Coated Products Co., Commercial Solvents Corp., Continental Carbon Co., Continental-Mexican Rubber Co., Converse Rubber Co., Deecy Products Co., Delco Rubber Co., E. F. Drew & Co., Inc., E. I. du Pont de Nemours & Co., Inc., Wm. D. Eggleston Co., C. E. Gale Co., General Atlas Carbon Division of General Properties Co., General Dyestuffs Corp., General Latex & Chemical Corp., General Magnesia & Magnesite Corp., Great Falls Bleachery & Dye Works, Givaudan-Delawanna Corp., Haartz-Mason-Grower Co., Alfred Hale Rubber Co., Hercules Powder Co., Hird & Connor, Inc., Hodgman Rubber Co., Holliston Mills, Hood Rubber Co., J. M. Huber, Inc., Hycar Chemical Co., Imperial Paper & Color Corp., INDIA RUBBER WORLD, Innis, Speiden & Co., Ernest Jacoby & Co., Keystone Lubricating Co., D. H. Litter Co., Malrex Chemical Co., Merrimac Chemical Co., Monsanto Chemical Co., Moore & Munger Co., H. Muehlstein & Co., Inc., Naugatuck Chemical Division, New Jersey Zinc Sales Co., Niagara Sprayer & Chemical Co., A. C. Nispel, Inc., Oakite Products, Inc., O'Dell Coated Fabric, Pacific Mills, Inc., Panther-Panco Rubber Co., Pennsylvania Industrial Chemical Corp., Pequanoc Rubber Co., Phillip Brothers, Inc., Pittsburgh Plate Glass Co., Plymouth Rubber Co., Pond Lily Co., Pratt & Lambert Co., R B H Dispersions, Raffi & Swanson, Inc., Respro, Inc., Rex-Hide, Inc., John Royle & Son, Sanford Mills, A. Schrader's Son, A. Schulman, Inc., Henry L. Scott Co., Sessions-Gifford Co., Shell Oil Co., Socony-Vacuum Oil Co., Stamford Rubber Supply Co., Stanco Distributors, Inc., Standard Chemical Co., Standard Lime & Stone Co., Standard Ultramarine Co., Stanley Chemical Co., Stedfast Rubber Co., Stewart-Bolling Co., Stowe-Woodward, Inc., Sun Oil Co., C. J. Tagliabue Mfg. Co., Taylor Instrument Cos., Texas Co., Thiokol Corp., Wm. R. Thropp & Sons Co., Tillotson Rubber Co., Titanium Pigment Corp., Turner Halsey Co., Tyer Rubber Co., Union Bay State Co., United Carbon Co., R. T. Vanderbilt Co., Vansul & Co., Waltham Bleachery, Warwick Chemical Co., Weller Chemical Co., Wilmington Chemical Corp., Chas. T. Wilson Co., Inc., Witco Chemical Co., Woburn Degreasing Co., Xylos Rubber Co.

Several photographs were taken of participants in the outing, and those on this page are indicative of the pleasures and recreation afforded by the occasion.

Rubber Division Meeting Cancelled

IT WAS announced during July by Harold Gray, chairman of the Division of Rubber Chemistry of the American Chemical Society, that the meeting of the Division scheduled to be held with the national meeting of the parent society in New York during the week of September 3, had been cancelled by the officers and directors of the Division. It was stated that this decision was reached after due consideration of the following facts: (1) Railroad facilities are already overcrowded. (2) Eastern seaboard ports will be more than crowded with military personnel, owing to movement to and from the battlefronts in western Europe, and every possible facility for movement of wounded and sick servicemen from the eastern seaboard ports westward must be made available. (3) It is also felt that the rubber industry cannot afford to have so many technical man-hours spent away from the factories during this period.

The officers and directors of the Division stated that it was with regret that it had become necessary to take this step, particularly so since the meeting was scheduled to be held with the national meeting of the A. C. S. and that it was felt that the men in the Division of Rubber Chemistry would lose a great deal by not being in a position to discuss technical matters with men in other divisions of the Society.

Los Angeles Group Meeting

THE meeting of Los Angeles Rubber Group, Inc., June 6, at the Mayfair Hotel, Los Angeles, Calif., was sponsored by The B. F. Goodrich Co., under the direction of Lee Horchitz, of that firm. Preceding the dinner, D. C. Maddy, Hycar Chemical Co., reviewed the April meeting of the Division of Rubber Chemistry, A. C. S., in New York, N. Y. The technical session closed with a forum discussion of Hycar synthetic rubber. Committee reports and the regular summary of current events by V. H. Vodra, R. T. Vanderbilt Co., Inc., opened the evening meeting. Goodrich members of the group and guests were introduced. The principal speaker was Alonzo Baker, radio commentator, who discussed American foreign policy. A $25 War Bond was awarded to G. J. Abali, and recipients of beverages were: S. T. Hall, R. L. Short, R. Cushman, K. F. Dunkel, H. Strant, B. Moon, F. Baglin, and Mr. Tomlinson.

Extender for Synthetic Rubber

PENTACIZER 344, a tackifier and extender for synthetic rubber, developed by the Heyden Chemical Corp., 393 Seventh Ave., New York 1, N. Y., has recently been announced as commercially available. It is a brown, resinous friable solid, soluble in ketones, aromatic hydrocarbons, vegetable and mineral oils, and synthetic rubbers. It is claimed that the use of up to 40% of Pentacizer 344 tends to soften and tackify GR-S and other synthetic rubbers, and that the tack will remain to a considerable extent after vulcanization. If less than 25% is used, the uncured stock possesses a good degree of tack, but the cured rubber is not sticky and will maintain good nerve.

Sunlight Resistant Wax

ANTISOL, a wax reported to improve resistance to atmospheric cracking of natural and reclaimed rubber and GR-S and Buna N synthetics has recently been made available to the trade by Herron Bros. & Meyer, 82 Beaver St., New York, N. Y. Some tests on synthetic rubbers in direct sunlight have indicated that GR-S cracks at a faster rate than natural rubber, and the new wax is expected to find considerable application to GR-S compounding. For maximum protection 4% of Antisol is recommended based on the rubber hydrocarbon. Antisol is said to flux well in rubber and to handle with ease.

UNITED STATES

Heavy-Duty Tire Output Lags; U. S., British, and Dutch Rubber Parley Scheduled; Dewey Resigns

At a press conference in Washington on July 25, Rubber Director Bradley Dewey announced that since the main purpose of the Office of the Rubber Director had been accomplished and the United States was now independent of foreign sources of supply of rubber, he had forwarded his resignation to the White House and had recommended that the Office of the Rubber Director be abolished on or before September 1. He recommended that the priority powers incident to the allocation of rubber goods and such regulation as the rubber goods manufacturing industry may need, as well as the determination of the industry's needs of products which are in short supply, be given to a Rubber Division within the War Production Board. "A Special Report of the Rubber Director, Recommending Termination of Special Powers, July 25, 1944" and "Progress Report No. 6" of the same date were also made public at the same time. Copies of letters from War Mobilization Director James F. Byrnes and from WPB's Executive Vice Chairman C. E. Wilson, approving the recommendations made by the Rubber Director were also made public.

These reports and letters will be published or abstracted in more detail in the September INDIA RUBBER WORLD. Since this development occurred just as the August issue was going to press, it was not possible to report it as fully as desired at this time. Some facts that should be mentioned, however, are the revelation that our natural rubber stockpile is still more than 100,000 tons, and a stockpile of 104,000 tons of synthetic rubbers has been built up. The serious shortage of large heavy-duty truck and bus, airplane, and tractor tires was emphasized at the beginning of "Progress Report No. 6", but it was made clear that the responsibility for supplying new workers lay with the War Manpower Commission. It was also pointed out that the present availability of synthetic rubbers should not lull the public into false security as to the necessity of taking care of its tires. It was stated that a supplementary report to be published late in August would give data on the costs of construction and the operating efficiency of the synthetic rubber plants. It will also give data as to the proven and estimated postwar costs of the resultant products. Total estimated production of synthetic rubbers for 1944 is given as 811,037 long tons and total estimated consumption for the United States as 697,000 long tons and for the United Nations as 883,000 long tons. Numerous charts and tables give butadiene production, synthetic rubber production and consumption, and the July, 1944, production plan for crude and synthetic rubbers and rayon and cotton tire cords.

Production Lag in Large Tires Causes Concern

The problem of lagging tire production, due to a shortage of the right kind of trained manpower, absenteeism, and some production and technical difficulties, which has been occupying an increasing amount of the time of government and industry leaders during the past two or three months, worked its way into the position of practically the No. 1 problem in the rubber program during July. Following a study of the tire production lines in Akron in connection with the dedication of the government's pilot plant and evaluation laboratory on June 28, Rubber Director Bradley Dewey returned to Akron with Lt. Gen. William S. Knudsen, director of production for the War Department, on July 6 for a three-day conference with industry and labor officials to determine ways and means of obtaining the large extra production of military and truck and bus tires so urgently needed to meet military and essential civilian requirements at this time.

As a result of these conferences, absenteeism reported from various sources as between 5% and 10%, a need of 900 more tire workers in the Akron area, the more difficult and more lengthy processing required with GR-S, and the fact that military tire production was 30% behind schedule were given as reasons why the tire production problem was now one of the most serious situations in our entire war production program. The Army, as evidence of its great need of more tires, agreed to release from active duty a number of fully trained tire makers 30 years and over in age who were still in this country, but although six rubber companies in Akron produced a list of 600 names of tire builders now in the Armed Services, the most optimistic of the officials of these companies indicated that the return of 20% of these workers to the factories was about the best that could be hoped for. General Knudsen and Rubber Director Dewey were reported as agreed that there was no shortage of tire manufacturing machinery. The problem was to find labor to man the additional machinery as it arrived at the plants. In the course of the conferences industry officials were told that large amounts of motorized equipment were lost on D-Day, that Allied bombers have done such a thorough job of blasting French railroads that all invasion material must move forward by truck, and, finally, that the production schedules for heavy trucks and artillery have been increased greatly—all of which mean more heavy tires.

On July 17 a "Tires for Victory" rally at the armory in Akron was attended by numerous high ranking military and civilian officials from Washington and elsewhere, and at which two of the most famous heroes of the war, Capt. John S. Gentile and Corp. James D. Slaton, were present and joined in the appeal to the tire workers for increased production. Other speakers included Gen. H. H. Arnold, commanding general of the Army Air Forces and Colonel Dewey; while also present at the rally were Artemus L. Gates, Under-Secretary of the Navy for Air; Rear Admiral D. C. Ramsey, Chief of the Naval Bureau of Aeronautics; and Major Gen. L. H. Campbell, Chief of Army Ordnance. Attendance at the rally by tire workers, however, was reported as not being up to expectations. Advices from Akron indicated that a more personal approach to the workers was believed necessary.

In his talk at the rally the Rubber Director reported that production of synthetic rubber during the second quarter of this year was 209,000 long tons, or at a rate of 836,000 long tons per year, and during the first half of the year was 376,000 long tons. All the work that has been done in building the synthetic industry, in providing new machinery in the rubber manufacturing plants and in providing extra rayon and cotton tire cord, is today jeopardized by shortage of manpower for building of large heavy-duty and airplane tires, he added. Obtaining new workers and more tires from the present workers were emphasized as two of the ways of solving the problem. The War Production Board stands ready, where necessary, to curtail less essential work to make labor available for the building of tires, and management has given assurance that it will make every effort to transfer from less essential work to the manufacturing of tires those who are capable of making tires, it was further stated.

Also on July 17 it was announced that the ODT, the WPB, and the OPA were working on a rationing plan for heavy-duty truck tires based on essentiality of operation to the war effort. Shortage of large-size truck tires has become so acute in recent weeks, it was said, that hauling operations vital to the prosecution of the war have been interfered with seriously. The August quota of large truck tires has been set at 60,000 by the Office of the Rubber Director, a reduction of 75,000 tires from the July distribution. The Army has offered to use some of its facilities for interstate hauling of vital products if the shortage of tires appears to be disrupting long-distance truck hauling, it was reported.

International Rubber Parley Scheduled

Hardly more than a month had elapsed since the announcement of the formation of a government-industry advisory panel on rubber by our State Department when in the middle of July it was revealed that the United States and Netherlands Governments had accepted an invitation from Great Britain to attend a three-party conference in London on postwar rubber problems. U. S. State Department representatives are B. F. Haley and W. T. Phillips, and in the American group in addition will be P. W. Litchfield, chairman of the board, Goodyear Tire & Rubber Co.; John L. Collyer, president of The B. F. Goodrich Co.; Harry E. Smith, general manager, Manhattan Rubber Mfg. Division, Raybestos-Manhattan, Inc.; H. Clay Johnson, vice president, Rubber Reserve Co.; J. W. Bicknell, executive vice president, Rubber Development Co.; and R. A. Gordon, United States coordinator on the Combined Raw Materials Board.

It should be mentioned here that Mr. Collyer on June 29 in Washington stated that the intensified military campaign against Japanese-held areas in the Pacific emphasizes the necessity of "obtaining as much desperately need natural rubber as possible, and with utmost speed, when rubber areas begin to come again under Allied control." Equally important, Mr. Collyer pointed out, was "the need for sound policies to deal with the economic and political problems the gradual 'return of rubber' will raise." Continued allocation of rubber, both natural and synthetic, during the war period and no change for the duration in the present system of centralized purchase of natural rubber by each nation, and allocation to its rubber product makers were recommended. With respect to the specifications as to the ratio of natural to synthetic in rubber products, Mr. Collyer said that although an increasing supply of natural rubber would tend to remove the necessity of wartime controls, it might be desirable that the natural rubber content of finished products continue to be fixed for a while. The controls can be progressively

eased and, as soon as possible, should be removed altogether.

Also of interest in this connection was a report of an address by Harold F. Copeman, chairman of the Rubber Growers' Association, London England, given before the annual meeting of this Association on April 27, and reprinted in the financial section of *The New York Times* of July 1 under "Financial Advertisements." In this address it was stated that regulation under the old regime was to all intents and purposes at an end, but the hope was expressed that international action to secure the long-term interests of rubber producers and consumers alike in conformity with such principles for international commodity schemes as may be generally accepted after the war, might be arranged for. The importance of beginning preliminary discussions among interested parties as soon as possible was emphasized. The world's vital need of natural rubber was underscored after tribute was paid to the American achievement of building a huge synthetic rubber industry. The pioneer work of the British and the Dutch in improving estate health and sanitation and the standard of living of the natives and in applying the most advanced scientific work for the betterment of the plantation industry was considered as having laid very solid foundations for future progress that will be more internationalized than before, and that will attract into its orbit the plantation and synthetic industries to a greater degree than at present could be visualized.

Comment on the forthcoming conference of the British, Dutch, and American rubber interests was that although the expressed purpose of the talks was to be "exploratory" with regard to the probable nature of postwar problems, both for crude and synthetic, one thing appeared certain: the strongly expressed prejudice in this country against any restrictive agreements along the line of the Stevenson plan or otherwise, would have to be reckoned with in this or any future conference.

Increased Natural Rubber Production in India, Ceylon, and South America

It was reported during July that natural rubber production from India and Ceylon during 1944 should be between 120,000 and 130,000 tons and that a larger proportion of this crude will reach the United States since we are now delivering appreciable amounts of synthetic rubber to the British Isles. At about the same time estimates of 1944 production from South America were set at about 33,000 tons, or about a 30% increase over 1943 production from this area. The higher price of 60¢ a pound being paid for the best grades of this rubber and the now adequate availability of ample supplies for tappers in the Amazon Basin as a result of the work started two years ago by the Rubber Development Corp., were given as reasons for the estimated increase.

Du Pont Licenses U. S. S. R. to Produce Neoprene

As the result of negotiations undertaken at the request of the United States Government, E. I. du Pont de Nemours & Co., Inc., is making its neoprene synthetic rubber process available to the Soviet Union, it was announced on July 2. No compensation is being asked of the Soviet Union for the production of neoprene while Russia is at war with Germany, and the amount of compensation in the postwar period will depend upon the volume of Russian production of neoprene. The agreement was entered into at the instance of Rubber Director Dewey in the interest of the war effort. Russia has been receiving large quantities of American neoprene products under Lend-Lease, including belting, hose, and other mechanical rubber goods, and is therefore familiar with the properties of the material, the announcement stated. It has been known for some time that the Russians produce a chloroprene rubber called Sovprene, but not too much is known about the quantity or quality of this similar type of rubber as made in Russia. The du Pont company expects Russian engineers and industrial supervisors to visit the plants at Deepwater, N. J., and at Louisville, Ky., in order to secure first-hand information on the operation of the neoprene process.

Butylenes Diverted from Rubber and Alcohol Needs Reduced

In view of the statements made during the past several months regarding the urgency of making the maximum amount of both industrial alcohol and butylenes from petroleum for the production of synthetic rubber, we were presented during July with the seeming paradox of 400,000 barrels of butylenes being diverted from rubber to aviation gasoline and the reduction of the alcohol requirements for 1944 by more than 20,000,000 gallons. The reason for the diversion of butylenes was given as the military requirements for all petroleum products which have exceeded anticipated demands, especially for 100-octane aviation gasoline. The reduction in the requirements for alcohol for synthetic rubber was again attributed to the very much greater than capacity operation of the rubber-from-alcohol plants and the fact that more synthetic rubber was being made than used because of the manpower shortage in the rubber products manufacturing part of the industry.

Thus alcohol will be called upon to make up the deficit created in the raw materials supply for rubber, but only so far as the alcohol-butadiene plants are concerned. The butadiene-from-petroleum plants may be utilized for the manufacture of alkylates which enter into the aviation gasoline production. Temporarily, then, the ratio of butadiene-from-alcohol to butadiene-from-petroleum will be of the order of 70:30, with the resultant higher cost for the rubber produced. Walter G. Whitman, of the WPB Chemicals Bureau, on July 20 in presenting revised estimates for alcohol for rubber for 1944 and 1945 of 342.4 and 335 million gallons respectively, stated that plans had to be made for either a tight or an easy alcohol situation in the fall of this year. Two vital factors that will influence the situation, he said, were the rate at which butylenes were diverted from the rubber program and the rate at which GR-S was used in making tires. It was also revealed that Mr. Haley, of the State Department, who will head the American group attending the exploratory talks on postwar rubber problems in London during the next month or so, addressed the WPB Industrial Alcohol Producers Industry Advisory Committee on the problems involved and discussed the background for the parley.

Standard Oil Sues to Regain Patents

Standard Oil Co. of New Jersey in mid-July moved in federal court for injunctions to compel the return to it of securities and patents turned over under protest to James E. Markham, Alien Property Custodian. Eugene Holman, president of Standard Oil, in commenting on the APC action said, in part:

"The Custodian has sought to create the impression that he is seizing enemy property and passing it on free to Americans for their use. Actually, he has confiscated valuable property belonging to American citizens, property in which many American companies have invested huge sums in patent licenses and development work. Under our laws, all patents are available for war production. But the Custodian, presumably acting under the advice of the Attorney General's office, has arbitrarily adopted a policy of granting free licenses under these patents, not limited to the war, but for the full life of the patents—without waiting for court decision on ownership of the patent properties themselves. Instead of holding and conserving such property as Custodian, he is dissipating the property and destroying the stimulus to develop it. This practice is completely without precedent and without Congressional authority."

Mr. Markham in reply denied the accusation that his office had confiscated valuable property belonging to American citizens. The Custodian, who demanded surrender of the securities and patents on May 24, said:

"My office has given full consideration to the claims of the Standard Oil Co. that it was the owner of certain patents and shares of stock involved in arrangements with I. G. Farbenindustrie, A.G., the German chemical and dyestuff trust. After examining the facts and discussing the case with representatives of Standard Oil, we concluded that I. G. Farben owned both the patents and the securities at the time of our seizure."

Mr. Markham said that he was fully satisfied to have the complicated question of ownership settled by the courts, and added: "It has been the consistent policy of this office to respect and preserve legitimate American rights in enemy patents when outstanding American rights will not be impaired. This office has adopted the policy of encouraging the widest possible utilization of the enemy patents in the interest of the American public."

Channel Black Placed under Allocation

WPB early in July revoked Order M-244, transferred allocation control of furnace-type carbon black to Order M-300, and extended allocation controls of M-300 to include the rubber grades of channel-type carbon black. This brings rubber grades of channel black under allocation for the first time. In the interests of simplified paper work, customers may now order up to 20,000 pounds of furnace or channel blacks by filing an end-use certificate with the supplier, who must then obtain WPB authorization for shipment of such quantities on Form WPB-2947. WPB authorization is required for all quantities over 20,000 pounds. For amounts over 20,000 pounds the customer seeking authorization to use or accept delivery must file application on Form WPB-2945 and the supplier must file Form WPB-2947 also. The filing date on the 2945 form is the fifteenth day of the month preceding the requested allocation month, and on the 2947 form is the twentieth day. The small order exemption remains at 100 pounds with no end-use restriction. The channel black initial allocation date is August 1.

Correction

IN REPORTING on page 311 of our June issue the address of H. T. Herrick, director of the Northern Regional Research Laboratory, Peoria, Ill., it was printed in error that a butadiene yield of 55.4% of theoretical could be obtained by the process initiated at the laboratory. The correct yield is 85.4% of theoretical.

Footwear and Tire Schedules Revised by OPA

Flat cord soling slabs for shoes with a stitch tear test of at least 60 pounds (dry and wet) may be sold by manufacturers to the shoe factory trade on an adjustable pricing basis for the time being, according to Order 14 to MPR 477—Sales of Rubber Heels and Soles in the Shoe Factory and Home Replacement Trades—effective July 13. Dollar-and-cent ceilings already are provided for these slab sales except where the stitch tear test is 100 pounds or more (dry) and 85 pounds or more (wet). Where the latter-type slabs are made, ceilings may be established at a higher level only by specific authorization of OPA, with adjustable pricing permitted. Order 14 applies to slabs with a weaker stitch tear test than those provided with special ceilings on application, but which are well above the stitch tear test of slabs generally sold at the prevailing dollar-and-cent ceilings. The latter have a minimum stitch tear test of 30 pounds (dry) and 25 pounds (wet).

OPA said that some manufacturers were now making slabs with the newer stitch test and had applied to OPA for special ceilings for them. Data must be obtained on which to base the new ceilings, but in the meantime manufacturers are allowed to sell the slabs on an adjustable pricing basis. Under this method sales and deliveries can be at prices to be adjusted upward later by OPA. Until OPA establishes new ceilings, however, no payment can be made in excess of the existing ceilings. When the new ceilings are set, the adjustable pricing authority automatically is revoked.

Amendment 14 to MRR 200—Rubber Heels, Rubber Heels Attached, and Attaching of Rubber Heels—effective July 1, brings under the regulation a new composition rubber heel of The O'Sullivan Rubber Co., Winchester, Va., which it is marketing under the brand name "O'Sullivan."

Several revisions, effective July 3, are contained in Amendment 12 to RO 6A—Men's Rubber Boots and Rubber Work Shoes—affecting rubber footwear establishments that close out or transfer their entire stocks of such footwear. As before, the transactions are to be reported to the OPA district office serving the area where the seller is registered. The revisions specify in detail the action to be taken by dealers, as well as by employers who furnish rubber footwear to their employes.

Changes in Tire Orders

When special packing has to be provided for overseas shipments of new rubber tires and tubes sold to a government agency, the extra costs incurred for this work can be added to the existing ceilings for the tires and tubes, according to Amendment 7 to MPR 415—Certain Federal Government Purchases of New Rubber Tires and Tubes. These additions, which can be made by suppliers, will apply to shipments made since June 12, 1944, when it was provided that prices charged could be adjusted upward in accordance with any additions for special packing later granted by OPA. This adjustable pricing provision became inoperative automatically on July 8, the effective date of Amendment 7.

Revised Supplementary Order 34, which authorizes the price additions for special packing, is made applicable to these government purchases. Should any change be made in this order, the changes will likewise apply to government purchases of new rubber tires and tubes.

The order now permits the addition of (1) the difference between the total cost of standard packing and the total cost of packing to the specifications of the buyer, or (2) if the commodity has already been packed in standard packing and if repacking to the specifications of the buyer is required, the total cost incurred in the unpacking and repacking, less the reasonable value of salvaged materials, or (3) if the commodity has been initially packed to specifications of the buyer that are different from standard packing, and if repacking to new specifications of the buyer is required, the amount already permitted for packing other than standard plus the total cost of unpacking and repacking, less the reasonable value of salvaged materials.

Amendment 5 to MPR 435—New Bicycle Tires and Tubes—effective July 25, establishes ceilings for a new size of Ribgripper Deluxe Lightweight tire of the Pharis Tire & Rubber Co., Newark, O.

Amendment 1 to Order 14, RMPR 143—Wholesale Prices for New Rubber Tires and Tubes—effective June 28, establishes the ceiling for a 6.00 by 18, 6-ply passenger—car tire and maximum retail prices for certain imported natural rubber passenger-car tires and tubes and for natural rubber truck tires; while Order 5 to MPR 528—Tires and Tubes, Recapping and Repairing—sets maximum prices, effective June 27, for certain farm tractor tires made by Firestone Tire & Rubber Co., Akron, O.

Amendment 1 to RMPR 143—Wholesale Prices for New Rubber Tires and Tubes—effective July 5, makes changes in the table of minimum discounts in section 4(c).

Order 5 under MPR 528—Tires and Tubes, Recapping and Repairing—effective June 27, gives retail ceilings for three additional sizes of farm tractor tires as one company recently added these new sizes to its list. The ceilings, however, will apply to sales of these sizes by any company, at retail. Order 6, effective July 8, covers retail maximum prices for certain solid industrial smooth and hard rock lug tires made by the Goodyear Tire & Rubber Co., Akron, O.

All new tubes—passenger car, truck, tractor, implement—were removed from rationing July 1 under Amendment 78 to Ration Order 1A—Tires, Tubes, Recapping and Camelback. This action was taken with the concurrence of the Office of Rubber Director. Since December, 1942, certificates for new tubes had been issued for practically all vehicles and equipment upon proof of need. During May and June, however, no quotas were placed on the issuance of these certificates and the demand has been running at about 1,500,000 tubes a month. Present inventories and production are adequate to meet this demand, OPA said.

Because of the current tight situation in truck tires, Amendment 79, effective July 25, to make sure that no tire goes out of service before it has given its last mile of wear, limits authority for truck tire inspections to stations having facilities and personnel capable of doing a thorough, specialized job. The next amendment extended from July 15 through July 31 the period during which a manufacturer may transfer new passenger tires to dealers certificate-free.

Amendment 8, to RO 1B—Mileage Rationing: Tire Regulations for Puerto Rico—and Amendment 10 to RO 1E—Mileage Rationing: Tire Regulations for the Territory of Hawaii—both effective July 1, make extensive changes in tire rationing rules in their respective territories.

The demand for new passenger tires, exceeding the supply available for civilians, is undiminished, and, despite slightly increased quotas for July, all eligible applicants cannot be supplied, the OPA warned on June 30. The ORD set aside 1,950,000 new passenger tires for July, 50,000 more than the 1,900,000 allocated for June (an original allocation of 1,600,000 plus another 300,000 allocated in the month).

Charles F. Phillips, OPA deputy administrator for rationing, emphasized that requests for tires still far exceed the number available for rationing and that it will not be possible for some time to bring tire supplies in line with demand. The job can be done in the next several months, he added, only if motorists continue to have their tires recapped, as needed, with the high-grade camelback now available.

"The extra 300,000 tires we received in June and the higher quota we have been given for July will permit us to make a start toward meeting needs of occupational drivers. With the prospect of a quota in August equal to that for July, we may expect further relief," Mr. Phillips said. "But there is no ground, whatever, for all occupational drivers who apply to their local War Price and Rationing Boards for new tires to expect to receive them, even though there is no question of their eligibility. The tire problem right now is simple, but difficult to solve. It is a problem of supply and demand. The supply is too small, the needs too great, for all eligible drivers to get tires. It will take more time than we originally thought to supply 'B' card motorists, and it looks as though there will be no tires for 'A' car drivers until early in 1945."

Pointing out that the July quota was 450,000 higher than the May quota of 1,500,000 tires, Mr. Phillips said:

"The Office of Rubber Director is drawing on its reserves in order to raise the June figure to 1,950,000. The Rubber Director is doing this in order to clear away some of the backlog of unfilled requests for tires. Local War Price and Rationing Boards report that their quotas have allowed them to issue certificates for only about one-half of the bona fide tire requests they receive. The Rubber Director is helping us to meet this difficult situation. We hope to have it corrected later this summer."

ORD, OPA revealed, allocated for July and August, 3,900,000 passenger tires, the total OPA will receive during those months for meeting the requirements of "B" and "C" gasoline ration card holders. To supply so large a number of tires during this period ORD will continue to draw on its reserve stocks. ORD reports that current production is substantially less than the passenger tire quotas set for June, July, and August.

Reports received from 70% of the 5,500 local War Price and Rationing Boards, OPA said, indicate that about 733,000 unfilled applications from eligible drivers were on file the beginning of June. It is impossible to wipe out this backlog in a matter of days, or even weeks. It is believed, however, that the higher quotas announced June 30 will permit boards, during July and August, to satisfy normal replacement requirements and to reduce substantially the number of unfilled applications.

Although the quota for large truck and bus tires was increased slightly for July, the number available for civilians was far from enough, and it is realized that the supply will not keep in operation all vehicles needing these sizes.

"The shortage of large truck tires is the most critical problem in tire rationing at this time," Mr. Phillips said. "A few trucks and buses are already idle for lack of tires, and this condition may become further aggravated as the summer continues."

The quota of tractor-implement tires, although slightly higher than last month, continues considerably below the demand.

"ORD is unable to give us the truck and tractor quota for August at this time," Mr. Phillips said. "Because of heavy military demands, the August quota may be reduced. However, the uncertainty of increasing military demands means that ORD cannot estimate at this time just how much can be allocated for August.

"The quota is in excess of the current production of civilian truck and tractor tires. During this month we shall undoubtedly deplete our existing inventory of new and used heavy truck tires. This possibility had been clearly foreseen. Both ORD and OPA have repeatedly said that the Summer of 1944 would mark the low point in truck and tractor tire supply."

Following is a tabulation of July quotas and reserves by the types of tires (total figures for June are shown for purposes of comparison).

Type of Tire	Quota	Reserves	Total Allocation for July	Total Allocation for June
Passenger and Motorcycle:				
Grade 1 (new tires)	1,692,075	257,925	1,950,000	1,900,000
Truck and Bus:				
7.50 or smaller..	340,731	34,269	375,000	360,000
8.25 or larger..	131,019	3,981	135,000	125,000
Tractor-Implement:				
7.50 or smaller..	41,400	13,600	55,000	55,000
larger than 7.50....	18,400	4,600	23,000	20,000

Rubber Director Bradley Dewey, on June 30 also, issued the following announcement concerning allocations of passenger-car tires for July and August and also advised that an additional 300,000 passenger car tires were made available for June.

"The August passenger tire quota has been established at 1,950,000 units.

"The difficulties confronting manufacturers to produce to the maximum of their facilities, plus large military demands for airplane tires and for heavy-duty truck and combat tires, prevent any forecast at this time regarding truck tires for August. Present indications are that the August truck tire quotas will be substantially reduced.

"More new passenger-car tires are being released than are currently being manufactured, but this was planned during the winter months, when an additional reserve was built up in order to care for increased demand during hot-weather months. Quota for truck tires for July is in excess of production for civilian use and therefore probably will exhaust the small remaining inventories of both new and used truck tires.

"Buna S synthetic rubber is being produced at a rate which would permit of building many more tires of all kinds if labor were available to man existing facilities."

Other Orders Affected

Manufacturers and distributers of neoprene bulbs and bulb goods may continue, for another three months until September 30, with the present method of determining their ceilings, according to Amendment 16 to MPR 300—Maximum Manufacturers' Prices for Drug Sundries. Maximum prices have been determined on these items by adding specified differentials to the ceilings for natural rubber bulbs and bulb goods. A time limit was placed on the use of this method so that OPA could obtain from industry sufficient cost data for establishing a permanent pricing method for neoprene bulbs and bulb goods. The industry has requested further time in which to present these data.

Manufacturers of cable wrapping tape made of Buna S or Butyl who in March, 1942, quoted prices on the basis of weight are permitted to recompute their maximum prices on a per-yard basis after July 3, according to Amendment 16 to MPR 220—Certain Rubber Commodities. In some cases ceilings were formerly based on the weight of the material. Natural rubber, however, is heavier than the synthetic types, and since the unit of use is area rather than weight, the new method for arriving at maximum prices is fairer to the manufacturer and does not increase the cost to the consumer above that for the same number of yards of tape made of natural rubber during the base period, OPA said.

Amendment 66 to Rev. SR No. 1 to the General Maximum Price Regulations, effective July 15, places benzol, toluol, and xylol under price control at March, 1942, levels. Exempted, however, are sales of benzol by the Defense Supplies Corp. The new order, furthermore, does not apply to the three products when produced from petroleum. Previously sales of benzol, toluol, and xylol for the production of aviation gasoline and synthetic rubber had been exempted from price control; while all sales for normal commercial purposes had been subject to GMPR. But DSC and Rubber Reserve Co. reported that their practice is not to purchase products at prices higher than commercial ceilings. Besides production of the light oils expanded last year to such an extent that it is no longer necessary to pay a premium to foster capacity operations.

New Rayon Tire Cord Mill

Capacity operation at the rate of 12,000,000 pounds a year of high-tenacity rayon tire cord is expected to be attained by August 31 at the new Clemson, S. C., plant, recently erected by Deering, Milliken & Co., 450 Seventh Ave., New York, N. Y. The windowless tile brick building contains 125,000 square feet of floor space and is equipped with a Carrier system of temperature and humidity control. The mill, which employs 250 people, has a complete testing laboratory and a water filtering plant. The Clemson plant is said to be the third largest producer of rayon tire cord in the country, and the largest of those whose operations are confined to twisting and weaving. The factory cost $2,000,000 including plant, machinery, and 50 modern brick homes for key employes and their families. F. G. Kingsley is president of Deering, Milliken & Co., and D. D. Quillian has been named plant manager.

R-1 Revised

A revision of Rubber Order R-1, issued July 1, incorporates all the revisions that have been made in it during the past six months. No important additions to the list of products that may be made for civilian uses are included. In the main, the revised order effects a conversion to the use of a greater percentage of synthetic rubber in heavy-duty bus and truck tires, and provides that passenger tubes for civilian cars be compounded of GR-S. Butyl rubber is reserved for military and large-size bus and truck tires. The sequence for filling orders of rubber heel and sole products is the following: military, civilian, government orders other than U. S. Armed Forces, and all other orders. Garden hose may be produced or delivered without regard to preference ratings. Permissible inventories for crude rubber, latex, reclaimed rubber, balata, GR-S, neoprene, and "Thiokol" may not exceed a 60-day supply; for chlorinated rubber and synthetic rubbers not listed the limit is 30 days. In general, the restrictions on the use of reclaimed rubber have been eased. Throughout, the order reflects the growing need of conservation of the natural rubber stockpile.

General Limitation Order L-61, as Amended July 18, 1944—Tire Retreading, Recapping, and Repair Equipment—underwent extensive revision covering such points as definition of "approved order", production and delivery regulations, production patterns, and preference ratings.

General Limitation Order L-277, as Amended June 29, 1944, has been extended to include under its coverage replacement heater cord sets as well as electrical wiring devices. These cord sets were originally under General Limitation Order L-65—Electrical Appliances—amended June 29 to take care of the transfer.

Limitation Order M-353, as Amended June 30, 1944, has been amplified by the addition of zinc sulphide to the order, to be classed with titanium dioxide under the designation "white pigments."

The WPB on July 11 reported that so short is the supply of phthalic anhydride that military uses for the coated fabrics were cut for the month of July. None was available for civilian requirement.

At the first meeting of the Coumarone-Indene Resin Manufacturers Industry Advisory Committee last month, members discussed means of obtaining an improved distribution of coumarone-indene resin for military and essential civilian requirements. Coumarone-indene resins, light-oil fractions distilled from coal tar and polymerized into resins, are used chiefly in the compounding of synthetic rubber, protective coatings, adhesives, and floor tiles. Members of the newly formed committee are: Lee V. Dauler, The Neville Co., Pittsburgh, Pa.; R. W. Ostermayer, Pennsylvania Industrial Chemical Corp., Clairton, Pa.; R. C. Quortrup, The Barrett Division, Allied Chemical & Dye Corp., New York, N. Y. George H. Sollenberger is the government presiding officer.

John W. Boyer, chief of the Alcohol and Solvents Branch of the Chemicals Bureau, has resigned to establish himself in Washington as a consultant to the chemicals industry. He is succeeded by Frank E. Bennett, chief of the Industrial Alcohol Unit of the WPB Chemicals Bureau.

The United States Department of Commerce, Washington, D. C., last month announced that it is preparing to release statistical information on production and distribution to business and industry as soon as requirements for military security will permit. It is also planning to conduct in fiscal 1946 the biennial census of manufactures, a census of mineral industries, a census of business, and a sample census of population, to provide business and industry with basic facts for planning future operations. The biennial census of manufactures for 1941 and 1943 were suspended under provisions of the Second War Powers Act, consequently the most recent data on manufactures, business, and mineral industries relate to 1939.

The Rubber Manufacturers Association, Inc., 444 Madison Ave., New York, N. Y., has released "Switching Tires Increases Mileage" and "Recaps Keeping Cars on Road", the last two of a series of six news releases designed to acquaint the public with ways of prolonging tire life.

OHIO

Firestone Displays War Goods

The War Products Exhibit of the Firestone Tire & Rubber Co., Akron, O., in the ballroom of the Waldorf-Astoria Hotel, New York, N. Y., was open to the public July 8 after invitational showings to several thousand military, industrial, business, and civic leaders July 6 and 7. The display included all the war products manufactured by the company. A huge barrage balloon filled the stage, and a Bofors 40-millimeter mobile anti-aircraft gun and an autogiro stood in the middle of the ballroom. Most spectacular of the many auto and plane tires exhibited was the 36.00-40 size for earth-moving equipment. The tire, 10 feet high and 39 inches wide, weighs 3,646 pounds. The thickest part of the tread contains five inches of rubber and cord fabric. Other airplane tires included the channel tread, low profile, smooth contour, and B-19. Flotation gear displayed featured a 33-foot pontoon bridge of rubberized fabric which can be transformed into boats for ferrying men and material, landing boats, and life rafts in various sizes, life-belts and life-vests of tear-resistant fabric coated on the inside with a layer of compounded synthetic rubber of maximum air or gas-holding qualities, and a jungle flotation bladder of rubberized fabric. This article was designed to keep a soldier afloat while crossing rivers and lakes with full equipment, but army men have found that it also serves as an excellent pillow or cushion. The pneumatic boats and military pontoons are all made with synthetic rubber. Also shown was a propeller anti-icing fluid distributer which consisted of strips of synthetic rubber cemented to the leading edge of propellers and supplied with ice removing fluids.

Puncture-proof tubes were described as having a thick inner layer of uncured rubber under the tread area. When a sharp object penetrates the tube, the soft inner layer of rubber squeezes around it, and prevents air from escaping. When the object is removed, the soft uncured rubber is forced by the air pressure into the hole and closes it. Dual-seal plane tubes with a two-ply emergency "tire" of safety lock cords built inside a tough, heavy rubber air container were also shown. The inner "tire" remains inflated, after a blowout, with enough air to allow a safe stop. Parachute seats and backs of cattle hair felt with a rubber covering, developed to replace scarce foam rubber cushions, pressure-sealing bushings of molded synthetic rubber cured to lubricant-impregnated fabric and other plane bushings, and bullet-sealing gasoline and oil tanks lined with a synthetic rubber gum were among other aircraft products displayed. Tank tracks and half-tracks for scout cars and other highly mobile equipment of synthetic rubber bonded to metal were said to withstand heat developed by high speeds and the abrasive action of rough terrain. Other equipment for war vehicles included batteries, spark plugs, synthetic rubber brake and radiator hose, and bogie rollers of rubber bonded metal. A divided rim which holds combat tires so tightly in place that they will run for several miles after being punctured by bullets also permits use of military tires at low inflation pressures, thus increasing their flotation.

Troop equipment included gas masks, plastic helmet liners and gun stocks, raincoats of fabric impregnated with rubber, walkie-talkie radio battery cases, and crash pads for wall lining in tanks and planes.

A Corner of the Firestone War Products Exhibit

These latter of bound hair to replace foam rubber may later be made of synthetic foam rubber. Screening of Velon, a plastic material, extensively used in jungle combat areas, was also exhibited.

Two films, "Freedom Rides on Rubber" describing the manufacture of synthetic rubber, and "All Out for Victory" which shows the production lines from which the products exhibited came, were screened. There were a replica of a Liberian rubber plantation and a demonstration of the process of synthetic rubber making.

Harvey S. Firestone, Jr., president of the Firestone Company, announced at the opening of the War Products Exhibit that the $75,000,000 industry program for expanding tire making facilities was nearing completion. A 40% greater manufacturing capacity will be available to the country's rubber plants by late autumn, and synthetic rubber production will soon yield 850,000 tons a year, he said. Mr. Firestone stated that he did not advocate a protective tariff for synthetic rubber after the war since he believed that it could compete favorably with natural rubber.

New Products Reported

L. R. Jackson, Firestone's executive vice president, recently announced the development of a non-metallic bullet-sealing shell for synthetic rubber aircraft oil tanks in which plies of glass fabric are impregnated with a resin called Velite. The oil tanks and the shell are cured as one unit. A bullet leaves only a thin slit in the rigid structure. The sealing portion of the tank is supported after gunfire, and oil leakage is cut to a point lower than that obtained by the use of metal shells which were distorted by bullets.

Firestone recently announced completion of the world's largest rubber lifeboat which will carry 25 persons and provisions to keep them alive 30 days. The pneumatic-type lifeboat made from coated and weather-proofed fabric weighs 575 pounds packed and folds into a pack five feet by seven feet by 18 inches. Inflated the boat is 25 feet long and has a beam of 10 feet. Occupants have a space 21 feet by six feet, in which are fastened six lateral seats each six feet long. Bulkheads in the buoyancy tube, 24 inches in diameter, keep the boat afloat even if it is damaged. Additional protection is provided by a removable and inflatable bottom, capable of acting as an auxiliary raft. The lifeboat is inflated with compressed carbon dioxide. Pressure in the buoyancy tube can be maintained as required by a hand-pump.

Building permit has been issued for alterations and improvements to a factory building at the Firestone plant at 2525 Firestone Blvd., Los Angeles, Calif., to cost $8,000.

The B. F. Goodrich Co., Akron, has appointed Jay E. Miller, sales promotion manager, industrial products and sundries division since 1943, advertising manager of the division in addition to his present duties. Mr. Miller has been with Goodrich since 1936 and was advertising and sales promotion manager of the sundries division until last year.

Paul W. Watt, with Goodrich since 1915, has been named manager of all factory service departments. His experience with the company includes service in the tire and processing divisions and the labor and time study departments. He was manager of planning and scheduling in the processing division before being made staff manager of the service division in 1942.

The Philadelphia Rubber Works Co., Akron, on July 15 moved its general offices to the Rose Bldg., E. 9th and Prospect, Cleveland 15, where the chemical division of The B. F. Goodrich Co. is also located now. Allyn I. Brandt, vice president of Philadelphia Rubber and general sales manager of rubber chemicals of Goodrich's chemical division, will make his headquarters also in the Rose Bldg.

The Timken Roller Bearing Co., Canton 6, last month announced that Brace-Mueller-Huntley, sales representative for Timken electric furnace alloy steels and seamless alloy steel tubing, has also been appointed representative for Timken stainless steels. The firm has warehouses at Buffalo, Syracuse, and Rochester, all in N. Y. and in Montreal, P. Q., and Toronto, Ont., both in Canada.

Pharis Tire & Rubber Co., Newark, has appointed Ralph M. Reel vice president in charge of manufacturing, and William Bachout comptroller. With Pharis since 1926, Mr. Reel has served as chief chemist, factory superintendent, and factory manager. Mr. Bachout was associated with the Eclipse division of Bendix Aviation Corp. before coming to Pharis.

Goodyear Personnel Changes

Goodyear Tire & Rubber Co., Akron, has made N. R. Cadot assistant to R. S. Pope, director of personnel. Mr. Cadot's former post, manager of the efficiency department, went to Earl Gilleland, for the past three years production superintendent at Goodyear's aircraft plant in Arizona.

Nelson G. Ball, for the past two years assistant personnel manager at Goodyear Aircraft, has been appointed assistant factory personnel manager at Goodyear Tire. He has been with the company since 1926.

A. C. Michaels, superintendent of Goodyear Aircraft Plant D, Akron, since it started, has been made manager of the Arizona division of Aircraft, Litchfield Park, Ariz., succeeding Ray Hudson, transferred to Akron on special experimental and development work. V. L. Follo, assistant superintendent at Plant D, becomes superintendent.

Stewart Reed has been made assistant manager of the advertising department of The Goodyear Tire & Rubber Export Co. With Goodyear since 1926, Mr. Reed was advertising manager of Goodyear-Australia from 1929 to 1942 and more recently handled public relations for Goodyear Aircraft Corp. in Arizona.

The thirteenth annual Goodyear employes' family picnic was held at Summit Beach Park on July 25, starting at 10 a. m. and continuing until 1 o'clock the following morning. There was no closing of any of the departments since the program had been planned on the round-the-clock basis so that employes on all shifts could enjoy the frolic.

R. P. Dinsmore, vice president in charge of research and development, recently was awarded his service pin signifying 30 years with the company. He had joined Goodyear's experimental department in 1914 and later worked at the Canadian and then California plants. He returned to Akron in 1921 as assistant development manager and chief chemist and was made assistant to the factory manager in 1932, development manager in 1939, and was elected vice president last year.

A new super-quality transmission belt for hammermills and other farm operations was announced July 20 by Goodyear. Known as the "Hammermill Special", the belt is made with high-quality synthetic rubber and in most respects compares favorably with the highest quality prewar farm belts, as it is built endless by a "round and round" method, eliminating any vulcanized splice. In addition this belt is made with a square edge. It is being produced in widths from five to seven inches and in lengths from 40 to 75 feet. This belt supplements Goodyear's "Klingtite Cord Hammermill" belt, an exclusive and patented Goodyear product built of a single layer of heavy cords to withstand the extreme flexing at high speeds over small pulleys.

The General Tire & Rubber Co., Akron, is making a new type of life raft, developed to prevent the capsizal of lifeboats upon which Army fliers must depend for their lives when forced to land in the sea. A ballast pouch which fills with water and serves as an anchor to keep the boat upright on a stormy sea has been designed for the boat. Other features are a boarding ladder so that anyone in the water can easily board the boat; handles on the bottom and inside so it can be easily righted in case it lands wrong-side up; and a cross-tube to give more room than was offered by the two seats provided on the older type boat.

Architect's Drawing of New Building for Seiberling Rubber Co.

Seiberling Expanding

A comprehensive program of construction to provide more than 35,000 square feet of additional tire production space and make available enlarged and improved facilities for factory and general offices and research laboratories, is under way at the Barberton plant of Seiberling Rubber Co., Akron, and is scheduled for completion late this year, according to President J. P. Seiberling. Proposed by the company early last year in answer to the Rubber Director's call for increased tire output, the expansion was approved by Seiberling stockholders in November, and construction of additional factory space was immediately begun.

Additional equipment for processing synthetic rubber, and new tire and tube machinery have been installed and are now in operation in a two-story factory addition.

A three-story reenforced concrete building, now under construction, will house the company's factory and general offices, employment office, hospital, research laboratories, and tire testing facilities and will release for production and storage all space now being occupied by the Seiberling offices, at present housed in a converted factory building in the heart of the plant allotment.

Douglas Mueller, head of public relations at Seiberling, is on leave of absence with the Armed Forces. His duties are being carried on by George F. Weisenbach, advertising manager, whose title will not change, but who will take on this additional work along with his regular duties.

EASTERN AND SOUTHERN

Calco Chemical Division, American Cyanamid Co., Bound Brook, N. J., on July 1 acquired the titanium dioxide manufacturing facilities of the Virginia Chemical Corp., Piney River, Va., from the Interchemical Corp. This organization, formerly a part of the United Color & Pigment-Interchemical set-up, now becomes a unit of the Calco pigment department, with J. Allegaert as manager and A. B. Hettrick as resident manager of the Virginia operation. Leo Sklarz is manager of sales; while A. R. Shive has been made director of technical services of the department, formation of which became effective July 1 also. Sam Klein, recently appointed western sales manager for Calco, will also handle sales for the pigment department in that territory, and Frank Reinhardt will represent the department in the Philadelphia territory effective July 1. The new department will handle all products formerly sold by Calco and United Color & Pigment Department to the pigment-consuming industries. Included will be Unitane (titanium dioxide) and other products of the Virginia Chemical Corp.

Shell Union Oil Corp., Inc., 50 W. 50th St., New York 20, N. Y., through J. Oostermeyer, executive vice president of Shell chemical division, announced last month that the WPB has authorized construction of an allyl chloride and allyl alcohol plant at Houston, Tex., with construction to begin at once. The new-type plant is the result of many years of research and development work on the part of Shell Development Co. While allyl chloride and allyl alcohol will have many interesting uses in the synthetic chemical industry, it is expected that immediate application of the output of the new plant will be in the field of plastics for aircraft and war material construction.

Pittsburgh Plate Glass Co., 632 Duquesne Way, Pittsburgh, Pa., has appointed Guy Berghoff director of public relations and Bryan England assistant director. For the past 10 years Mr. Berghoff has been assistant glass advertising manager. Mr. England, who has directed the company magazines, will continue to edit these publications and will assist in publicity work. The new organization is designed to avoid overlapping of departmental activities, to bring all publicity of whatever nature under one direction, and to integrate more closely the work of sales, advertising, publicity, and the company magazines.

Socony-Vacuum Oil Co., Inc., 26 Broadway, New York 4, N. Y., has appointed New England Division Manager A. L. Nickerson assistant general manager of eastern marketing with headquarters at 26 Broadway. Mr. Nickerson has been with the company since 1933. L. A. Myers, New England division manager of industrial lubricating sales, succeeds Mr. Nickerson. Mr. Myers has been with Socony-Vacuum since 1909.

Warwick Chemical Co., 580 Fifth Ave., New York, N. Y., dedicated its new Richmond Works plant at Wood River Junction, R. I., on June 28 as a concluding feature of an annual three-day meeting of all Warwick sales and executive personnel held in West Warwick and Providence. The plant, the fourth operating unit of the company, is expected to be in operation shortly after August 1. Speakers at the dedication included J. Howard McGrath, governor of Rhode Island; Ernest Nathan, president of Warwick Chemical; and Frank Richmond, chairman of the Warwick board for whom the plant was named. A shore dinner at Point Judith, R. I., concluded the ceremonies.

W. C. Hardesty

W. C. Hardesty Co., New York, and **Amecco Chemicals, Inc.,** Rochester, both in N. Y., have joined in the organization of the Hardesty Chemical Co., 41 E. 42nd St., New York, for the production of sebacic acid, capryl alcohol, dibutyl sebacate, and related compounds. Officers of the new company are: president, S. J. Cohen; vice presidents, William C. Hardesty, John Stead, and H. M. Abbott; treasurer, F. R. Cantzlaar; secretary, R. T. Heilpern. The Hardesty company and Amecco Chemicals will continue as heretofore production and distribution operations in their respective fields.

The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc., Passaic, N. J., has received the National Advertising Agencies Network first award for its "Employe Relations Program" at a conference of the NAAN. This program covers company publicity and other promotional activities dealing with employe and servicemen relations, and includes *Manhattan Service News*, the company's house organ; War Bond and other drives; Victory gardens; Christmas packages to servicemen; safety bulletins; conservation; employe's war exhibits; absenteeism, etc. Manhattan was awarded second prize for this program last year.

Associated Rubber Products Co., 1007 Springfield Ave., Irvington 11, N. J., has appointed D. E. Henderson technical director, with headquarters at the Quakertown, Pa., plant. Mr. Henderson received his B.A. degree in chemistry at Illinois College. In 1936 he entered the research department of The B. F. Goodrich Co., Akron, O., and in 1941 was made manager of the Hycar service laboratory. In 1943 he became technical service engineer for Hycar Chemical Co.

Thermoid Co., Trenton, N. J., has appointed Albert Grindy comptroller of the company and its subsidiaries. He will have general administrative and financial duties. Mr. Grindy formerly was treasurer of the Arnold Print Works, North Adams, Mass.

Thermoid also has named A. C. Teetsel manager of friction materials manufacturing. He was until recently executive vice president and a director of Ferodo & Asbestos, Inc., New Brunswick, N. J., and previously had done research, engineering and testing work with the Russell Mfg. Co., Middletown, Conn.

Neoprene Type GN-A

NEOPRENE TYPE GN-A, a synthetic rubber identical with GR-M except for the addition of a stabilizer, was recently made available by E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. The added stabilizer is said to retard or eliminate the tendency of this type of neoprene to become excessively sticky during storage in hot weather, and this type is therefore a better processing neoprene in summer than GR-M.

Endicott Johnson Corp., Endicott, N. Y., is erecting a $2,350,000 plant, under WPB authorization for the manufacture of soles and heels of synthetic and reclaimed rubber. The plant will comprise three brick and steel one-story units with a total floor space of about 122,000 square feet. One of the buildings will be used exclusively to store reclaimed rubber, now kept in the adjacent reclaiming mill, in which additional equipment will be installed to increase reclaim capacity to fill the needs of the new heel and sole unit. The third unit will house an 850 h.p. boiler. Production is expected to start in November, with capacity output to be reached six months later. Approximately 600 workers will be employed. Complete cost of construction, equipment, and machinery will be paid by the Defense Plant Corp., Washington, D. C., which retains title to the new plant and equipment. Endicott Johnson will operate the facilities, making heels and soles for military, Lend-Lease, and civilian shoes which are manufactured by other concerns.

J. S. Corrigall has joined the sales staff of R. T. Vanderbilt Co., Inc., 230 Park Ave., New York, N. Y., and will cover the New Jersey and eastern Pennsylvania territory. He has long experience in the rubber field, most recently with the Thiokol Corp., Trenton, N. J., and before that with the Cincinnati Rubber Mfg. Co., Cincinnati, O., and the Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont., Canada.

Hercules Powder Co., Wilmington, Del., recently announced that Russell H. Dunham has resigned as chairman of the board, but remains a director and chairman of the finance committee. President Charles A. Higgins was elected board chairman and will fill both offices. Mr. Dunham had been chief officer of Hercules since its founding in 1913. He held both the office of president and of chairman of the board until March, 1939, when he resigned as president of the company.

American Automobile Association, Pennsylvania Ave. at 17th St., Washington, D. C., recently published its findings and recommendations following an 18,000,000-mile "Keep 'Em Rolling" demonstration in an effort to conserve cars, tires, manpower, and highways. The report, "Conditions and Problems in the Passenger-Car Field", as adopted by the AAA executive committee, May 19, declares synthetic tires will give satisfactory service in excess of 20,000 miles if properly cared for, excoriates war workers wasteful of transportation, finds motor vehicle users in general not conservation-minded, and recommends the adjustment of inequalities in gasoline allotments and higher priorities for parts and garage equipment. Main highways were found to be holding up well under the impact of war traffic, but urban roads are badly deteriorated.

United States Rubber Co., 1230 Sixth Ave., New York 20, N. Y., has appointed Clarence L. Wanamaker general manager of the munitions division to succeed Ernest G. Brown, recently made general manager of mechanical goods, general products, and "Lastex" yarn and rubber thread divisions. Mr. Wanamaker, a native of Melrose, Mass., graduated from Dartmouth College and, as a well-known athlete, embarked upon a career of sports. In November, 1916, however, he became a cost clerk for American Rubber Co., a U. S. Rubber subsidiary in Boston, Mass. In 1921 he was made assistant treasurer of L. Candee & Co., New Haven, Conn. Then on November 1, 1928, Mr. Wanamaker was named factory manager of Lycoming Rubber Co., Williamsport, Pa., and after four years was made factory manager of U. S. Rubber's Mishawaka, Ind., plant where he remained nine years. In 1941, when the government requested the rubber company to build and operate a small arms plant, Mr. Wanamaker was one of the key men selected for the job at Des Moines, Iowa, becoming production manager of the munitions division. He later became factory manager of the new small arms plant at Milwaukee, Wis., and on June 1, 1943, returned to Des Moines as factory manager. On February 1, 1944, he was made production manager of munitions.

President Herbert E. Smith recently told of the use of collapsible rubber contour maps in the invasion of northern France. By a process developed in the company's laboratories a plaster negative is cast from a model showing coastlines, mountains, natural landmarks, buildings, etc. Natural rubber latex is sprayed and dried on the negative model. After reenforcements to prevent the thin layer of rubber from collapsing in its mountainous areas, which appear as depressions, the model is cured, stripped from the mold, and colored. The contour map can be rolled or folded into a small space.

The U. S. Tire Advisory Council, recently met at the Drake Hotel, Chicago, Ill., to hear A. B. Fennell, U. S. tire sales manager, and other company officials present a summary of the current tire situation and an analysis of the future outlook as it affects dealers all over the country. During the meeting W. B. Crow, of Birmingham, Ala., was elected chairman for the coming year. Others present included C. W. Ort, U. S. western division manager, Chicago; I. S. Johnson, manager, batteries and accessories; H. A. MacMullan, manager, advertising and sales promotion; H. R. Mack, manager, transportation maintenance; W. D. Mardick, Joplin, Mo.; J. H. Walsh, Jacksonville, Fla.; Charles Merz, Marysville, Calif.; Jack Pace, South Bend, Ind.; H. G. Barrenbrugge, Elmira, N. Y.; D. W. Walsh, general sales manager; G. A. Edwards, Kansas City, Mo.; R. B. Nelson, Seattle, Wash.; A. R. Johnson, Fort Worth, Tex.; Fred Novak, Hackensack, N. J.; R. E. Paul, Columbus, O.; Curt Muser, manager, passenger car tires; J. G. Schaefer, manager, repair materials; John Griffin, Kansas City district manager.

The Army Air Forces new Civilian Merit Award, given to civilians for outstanding contribution to the war effort, was recently awarded to D. D. Dayton, of U. S. Rubber's tire division. Mr. Dayton was attached to Wright Field as airplane tire specialist.

Carrier Corp., Syracuse, N. Y., has made Leslie M. Beals director of advertising and sales promotion and Walter A. Bowe manager of the advertising and sales promotion department.

MIDWEST

Safety Congress and Exhibit

The National Safety Council, 20 N. Wacker Dr., Chicago, Ill., will hold its thirty-third National Safety Congress and Exposition at the Morreson, Sherman, and La Salle Hotels in Chicago on October 3, 4, and 5. The Rubber Section is scheduled to hold its sessions the first two days. Below is the program as outlined to date.

Report of sectional activities by General Chairman Paul Van Cleef, of Van Cleef Bros., Chicago.

A symposium, "Safety in Processing Synthetics": (*a*) "Dermatitis in the Manufacture and Use of Synthetic Rubber", Louis Schwartz, medical director chief, dermatoses section, United States Public Health Service, Bethesda, Md.; (*b*) "Accident Control", Glen D. Cross, safety director, Firestone Tire & Rubber Co., Akron, O.; (*c*) "Fire Control", Henry C. Jones, vice president, Arkwright Mutual Fire Insurance Co., Boston, Mass.; (*d*) general discussion.

Election of 1944-45 officers.

Rubber section safety contest, 1943-44: (*a*) outstanding facts; (*b*) presentation of awards by J. I. Banash, past president, N. S. C.

A symposium, "Safety Problems Created by the Limited Labor Supply in the Rubber Industry": (*a*) "Psychology—An Aid to the Foremen", (speaker to be selected); (*b*) "How to Use Safely the Handicapped War Veteran", Dr. George Hostetter, Hines Hospital, Chicago; (*c*) "Experience Gained" (speaker to be selected); (*d*) general discussion.

Monsanto Chemical Co., St. Louis 4, Mo., has transferred Walter P. Konrad from the phosphate sales department in St. Louis to the branch managership of the phosphate division sales department in Chicago, Ill. He came to Monsanto in 1935 with the merger of the Swann Chemical Corp., a subsidiary of which he had joined in 1925.

President William Welch Speaking at Laboratory Dedication Ceremonies

Dedication of the New Research Laboratory of Midwest Rubber Reclaiming Co.

Rubber Director Bradley Dewey Unveiling Bronze Plaque at Laboratory Dedication

On June 27 the Midwest Rubber Reclaiming Co., East St. Louis, Ill., and Barberton, O., was host to some 150 guests who assembled at the East St. Louis plant to participate in the dedication of a new research laboratory built to meet the needs created by the large-scale usage of GR-S and other synthetic rubbers.

Foreseeing that a major new development was entering the rubber reclaiming field with the prewar activities in synthetic rubbers, William Welch, president of Midwest Rubber, took steps to keep that organization abreast of the times by sponsoring a basic research program at Massachusetts Institute of Technology. That work was placed in charge of E. A. Hauser in 1939 and has since been carried on in association with D. S. le Beau and several others in a laboratory equipped at the Institute in Cambridge, Mass. Theories, principles, and processes thus developed are not ready for introduction to the production lines of the reclaiming mill room. This basic material, reclaimed synthetic rubber, must be further developed to meet the product needs of the ultimate users of reclaims and must be adapted to the large-scale requirements of quantity production.

To supplement the basic research program Midwest laid plans for the construction of a new research laboratory at East St. Louis, and the completion of this project was the occasion for the large meeting on June 27. The guests arriving in St. Louis on early morning trains were met by special buses and taken to hotels where accommodations had been reserved. At 9:30 a.m. the buses were reloaded, and the guests taken to the plant located south of East St. Louis. There a large tent had been erected for the use of guests while registering, renewing acquaintances, enjoying refreshments, and listening to the ceremonies.

Small inspection groups were conducted through the Midwest plant, where, in addition to the usual preparation, devulcanizing, and milling operation with natural rubber reclaim, the guests observed mills producing reclaims of three types of synthetic rubber: GR-S inner tube stock, GR-S whole tire stock, and GR-M or neoprene. The inspection tour was completed with a trip through the new laboratory building.

The laboratory is a one-story brick and concrete structure in which separate rooms are provided for offices, chemical laboratory, physical testing laboratory, mill and press room, constant temperature and humidity test room, autoclave and high-pressure steam room, bomb aging room, and auxiliary storage and rest rooms. The equipment includes laboratory mills, refiners and presses, tubers, tensile testers, abrasion and flexing machines of several types, plastometers, and all necessary auxiliary equipment for the complete physical and chemical testing of natural and synthetic rubber.

The dedication ceremonies were conducted by Mr. Welch, who welcomed the guests and briefly reviewed the development of the Midwest plant during the past 16 years. Rubber Director Bradley Dewey, gave a brief talk in which he stressed the importance of research programs to the future advancement of the reclaiming industry and to the welfare of the companies engaging in such activities. Colonel Dewey then unveiled a bronze plaque commemorating the completion of the laboratory and designating the resting place of a sealed cylinder in which are deposited records of the corporation, samples of present-day products, movie reels of the plant, and other items. This cylinder is to remain sealed until June 27, 1994, and an invitation was given to all those present to be back on June 27, 1994, when the cylinder will be opened and the contents re-examined.

New Research Laboratory of Midwest Rubber Reclaiming Co.

Immediately upon completion of the ceremonies the guests were taken to St. Louis to attend a Chamber of Commerce luncheon. Colonel Dewey, the guest of honor, delivered an illustrated address to a large gathering of St. Louis business men in which he traced the development of the great synthetic rubber program and summarized the present status of the industry. It was his conclusion that there are synthetics available for every wartime and civilian requirement and that the bottlenecks are now limited to manpower and accessory materials needed to convert the synthetic rubber to finished products.

The meeting was then moved to the Coronado Hotel where an all-afternoon technical session was presented. The first paper, by Dr. le Beau, consisted of a review of the

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In this hose, as well as in thousands of applications on ships, tanks, planes, guns, it is doing a better job than the natural rubber Japanese conquest denied us.

For Perbunan resists oil, heat, cold and time! Developed in the great Esso Laboratories of the Standard Oil Development Company, it doesn't freeze up at 50 below, nor "soften" at 200 above.

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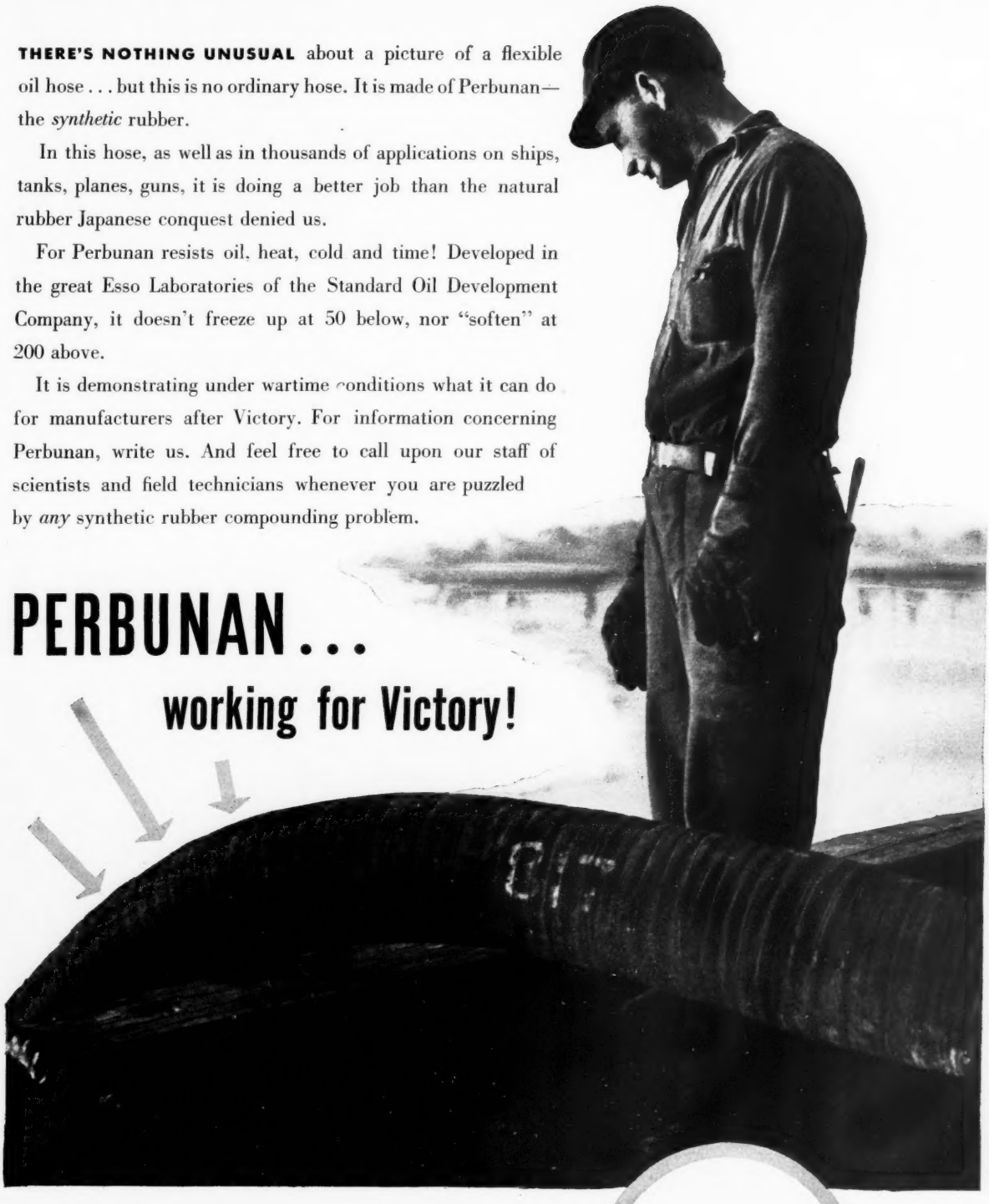

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electron-microscopic studies on natural and synthetic rubber fibers and the location and distribution of carbon black in particles, films, and fibers. This work has been conducted by Dr. le Beau, Dr. Hauser, and others at M. I. T. Another paper, presented by Robert L. Randall, chief chemist for Midwest, reported on the physical characteristics of reclaims made from GR-S scrap tires as compared with conventional natural rubber reclaims in the following formulations: (a) Grade F camelback, (b) Grade C camelback, (c) S-3 type tire carcass, (d) military heel, (e) military sole, (f) hard rubber, (g) high quality matting, (h) jar rings. In all cases the GR-S reclaim compared favorably with natural rubber reclaim, but showed a slight inferiority in its tear resistance, slower rate of cure, and lack of tack. These were faults which could be corrected by proper compounding, and it is expected that with further research on the art of GR-S reclamation a material will be produced which will be equal to or better than natural rubber reclaim.

The day was rounded out by a cocktail hour, followed by a dinner at which Mr. Welch and a number of guests gave short talks; and finally everyone attended the St. Louis Municipal Opera where an outdoor performance of the opera "Eileen" was enjoyed.

PACIFIC COAST

Acme Tire & Rubber Co. is the firm name under which Salvador R. Castaneda has published a certificate that he is conducting business at 515 E. Washington Blvd., Los Angeles, Calif.

National Motor Bearing Co., Inc., manufacturer of oil seals, Redwood City, Calif., through President Lloyd A. Johnson has announced the purchase of the Arrowhead Rubber Co., manufacturer of mechanicals, blown sponge rubber goods, and soles, Los Angeles, Calif. This acquisition insures National a steady, reliable supply of synthetic rubber flanges, a vital element of some of National's recently perfected oil seals. Further expansion will come about through the development of precision synthetic rubber packing, washers, and gaskets. Although Arrowhead becomes a wholly-owned subsidiary of National Motor Bearing, Harry Franklin will continue as president, director, and general manager, along with his staff of executives and more than 250 experienced personnel. Mr. Johnson becomes president of Arrowhead's board of directors, and Frederick E. Barth, manager of National's industrial division, will also serve on this board. Milton B. Bulkeley, National's treasurer, will act in a similar capacity for the new subsidiary corporation.

Commercial Rubber Co., 1601 24th St., Los Angeles, Calif., is erecting a new cooling tower at its plant at a cost of approximately $500.

Avon Rubber Co., 1612 San Pedro St., Los Angeles, Calif., has been formed by Aaron Barth and Raymond L. Cowles.

Roy A. Wissing, 48, for many years manager of the service department of the Goodyear Tire & Rubber Co. in Los Angeles, Calif., died at his home in Pasadena on June 6. He was prominent in Masonic circles. Surviving are his widow; his mother; a daughter, a son, a sister, and a brother.

Monarch Gasket & Roller Co. is the firm name under which Eugene Knoll and Leroy Ketler are conducting business at 1416 E. Flower St., Los Angeles, Calif.

CANADA

Plans for Chemical Institute

The interim board of directors of the Chemical Institute of Canada, 137 Wellington St., W., Toronto, Ont., has announced the election of the following officers: chairman, L. E. Westman; honorary treasurer, P. E. Gagnon; honorary secretary, R. R. McLoughlin; director of business, H. R. L. Streight; director of information, R. V. V. Nicholls; director of conferences, W. E. Pomeroy; director of professional affairs, L. Lortie; director of external relations, L. E. Westman. Dr. Streight is forming a membership committee in preparation for a membership drive. Plans are being made by the director of information for a news letter or journal for members and for organized subject divisions on both a local and national scale. A committee is also being established to draft a constitution and by-laws for the Institute. The paper on collective bargaining presented by Dr. Lortie at the recent Canadian Chemical Conference has been reprinted and distributed to the combined membership, and steps are being taken to obtain expression of opinions from the membership on this subject.

E. B. Babcock, United States assistant rubber director in charge of product development conversion, speaking before the fortieth annual meeting of the Canadian Transit Association in Quebec, P. Q., June 27, reported that approximately 70,000 tons of synthetic rubber were produced in the United States and Canada during May and added that production will continue to increase until 85,000 tons a month are available. He also stated that the United States and Canadian government bureaus and rubber industries have worked as one unit. In addition, the engineers and chemists of the United Kingdom have participated fully in the program, and the same changes to synthetics are being made by the industry in England as are being made in North America. The speaker said that Canada is leading in the production of civilian rubber goods from synthetics because the rubber facilities and manpower have been available at an early date. He paid tribute, too, to the crown-owned Polymer Corp. at Sarnia, Ont., referring to this plant as the most complete synthetic rubber unit of the entire program.

The Rubber Association of Canada made an all-day inspection tour of the Polymer Corp. plant at Sarnia, Ont., on June 23, by 26 representatives of firms comprising the Association. A formal welcome was extended by R. C. Berkinshaw, Polymer president, at a luncheon in the staff dining room. The party included: W. H. Bartlett and J. E. Jones, Toronto, Ont., Dunlop Tire & Rubber Goods Co., Ltd.; P. C. Jones and M. F. Anderson, Montreal, P. Q., Dominion Rubber Co., Ltd.; H. O. Allman, Toronto, and C. Cattran, Bowmanville, Ont., Goodyear Tire & Rubber Co. of Canada, Ltd.; R. J. Thomas and K. W. Gregory, Toronto, Seiberling Rubber Co. of Canada, Ltd.; C. S. Band, H. D. Warren and J. R. Belton, Toronto, Gutta Percha & Rubber, Ltd.; W. H. Funston and J. H. Foreman, Hamilton, Ont., Firestone Tire & Rubber Co. of Canada, Ltd.; G. W. Sawin and G. Armstrong, Kitchener, Ont., B. F. Goodrich Rubber Co. of Canada, Ltd.; V. P. Reid and A. C. Ansley, Toronto, General Tire & Rubber Co.; W. H. Miner and N. A. Austin, Granby, P. Q., Miner Rubber Co., Ltd.; A. R. Kaufman and I. K. Webber, Kitchener, Kaufman Rubber, Ltd.; E. and L. Barringham, Oakville, Ont., Barringham Rubber Co., Ltd.; A. Gagnon and P. E. Brunet, Acton Vale, P. Q., Acton Rubber, Ltd.; J. L. Babcock, Toronto, Canadian General Rubber Co.

Northern Electric Co., Ltd., Montreal, P. Q., has announced that under the company age rule Wm. A. Gilbery, cable division buyer, retired June 30 on leave of absence prior to pension, after 33 years with the company. He was succeeded on July 1 by E. B. Conley.

Dominion Rubber Co., Ltd., Montreal, P. Q., has announced that W. M. MacLean, former liaison officer between Canada and the United Kingdom and the Office of the Rubber Director in Washington, D. C., has rejoined Dominion Rubber, concluding his official connection with the federal government, after an absence of 15 months. He will undertake market research for raw chemicals to be manufactured by Naugatuck Chemicals Division of Dominion Rubber and will coordinate the activities of the research laboratories of the company at Guelph with the chemicals division at Elmira, Ont. A graduate of Acadia University (B.A. '29) and the University of Western Ontario (M.A. '31) in chemistry and organic chemistry, Mr. MacLean first became connected with the rubber company as a chemist in its General Laboratories, Montreal, and for five years was engaged in sales work in Montreal and Ottawa.

The board of Dominion Rubber along with leading executives of United States Rubber Co., New York, met in Kitchener, Ont., July 6, to give directors an opportunity of surveying the company's development in its major Canadian operational area. President Paul C. Jones, although he would make no comment on the crude rubber situation in the immediate postwar period, expressed satisfaction with the progress of the synthetic product under the pressure of war necessities. He also reported that the annual meeting of the company will be held in Montreal some time after the first of the year.

On the afternoon of July 6, the officials of Dominion and U. S. Rubber made a tour of Dominion's four plants in Kitchener and also made brief inspections of the Naugatuck Chemical plant at Elmira, a subsidiary, and the Dominion plant at Guelph.

Imperial Oil, Ltd., has named Alan C. Harrop, refinery superintendent at Calgary, Alta., superintendent of the company's refinery at Sarnia, Ont., to succeed J. Dean Bradley, now general superintendent of the Sarnia refinery.

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Reduce GR-S Content . . . Prevent Bloom . . . Improve Softening

Any saving in the raw stock used in rubber products is important at any time . . . but doubly important today. One Pennsylvania manufacturer of mechanical rubber goods discovered that the use of the right processing oil not only overcame certain production troubles but provided a plus advantage by reducing the amount of natural rubber and GR-S required in several of his products.

Surface bloom and difficult handling had been a constant source of trouble. Several years ago, in his efforts to correct these problems, he accepted the recommendation of a Sun Engineer and switched to Circo Light Processing Oil.

Bloom was eliminated . . . and he found, also, that he secured effective softening without the use of an excessive amount of oil with subsequent low tensile strength. His stocks were easier to handle . . . and he considered himself fortunate in overcoming his difficulties so completely. Then he made another discovery.

The GR-S and natural rubber content required was cut down approximately 10% through the use of Circo Light Processing Oil. This meant not only a substantial saving in his costs, but as time went on became a matter of essential conservation.

Sun Engineers are working constantly with important rubber goods manufacturers in solving tough production problems. Their broad experience, plus the outstanding quality of Sun products, has enabled them to help a great many producers. One of these men will be glad to study your problems, if you will write to us.

Lubrication, too, is important in your plant. A copy of the new Sun Lubrication Manual should be in the hands of your production man. It will be sent upon request, without cost or obligation.

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APPLICATION

United States

2,350,357. **Scouring Pad with Open-Ended Tubular Wire-Mesh Fabric Gathered together at Top and Bottom Ends with Rubber Bands.** D. J. Kelman, Brooklyn, N. Y.

2,350,359. **Knitted Slip Cover Having Panels with Elastic Thread Dispersed therethrough.** J. A. Krasnow, Melrose Park, and M. M. Kuller, Allentown, assignors to Sure-Fit Products Co., Darby, all in Pa.

2,350,362. **Resilient Heel Construction Including a Rubber-Like Layer Placed Between Heel Base and Heel Lift, a Rubber-Like Core Extending Through an Opening Passing Through the Length of the Heel Base, and a Perforated and Grooved Resilient Rubber Member Adapted to Contact the Wearer's Heel.** M. Margolin, Elgin, Ill.

2,350,398. **Ball and Socket Joint Including a Housing Having a Rubber Bushing.** G. H. Hufered, Detroit, Mich., assignor to Thompson Products, Inc., Cleveland, O.

2,350,438. **For Container Closing Machines, a Plunger Pad of a Tough, Slightly Flexible, Non-Chipping, Heat Resistant, Transparent, Synthetic Resin Material.** J. A. Woerz, assignor to Crown Can Co., both of Philadelphia, Pa.

2,350,679. **Inflatable Chair Consisting of Back and Seat Portions Built up of Short, Straight-Sided Tubes of Rubberized Fabric.** K. G. Hann, Cyncoed, assignor of one-half to Elliot Equipment, Ltd., Cardiff, both in Wales.

2,350,852. **Outsole Consisting of at Least Two Layers of Polyamides; the Layers Have Different Pliabili**[illegible] W. Wehr, Eilenberg, Germany; vested in the A[illegible]ien Property Custodian.

2,350,905. **Leakproof Seal of Synthetic Rubber or the Like for a Fluid Valve.** G. J. Koehler, Dayton, O.

2,350,980. **Resilient Wheel for Vehicles, including a Circumferential Rubber Band.** M. Benito y de la Rosa and D. Clavijo y Garcia, both of Havana, Cuba.

2,351,054. **Double-Walled Safety Inner Tube and Valve.** F. A. Krusemark, Chicago, Ill., assignor to Mansfield Tire and Rubber Co., Mansfield, O.

2,351,199. **A Stocking Having an Intermediate Section Including a One-Way Stretch Portion, and a Two-Way Stretch Elastic Portion.** S. R. Fry, Wyomissing, assignor to Narrow Fabric Co., West Reading, both in Pa.

2,351,235. **Light, Relatively Resilient Liner for a Metal Helmet Built up of Layers of Fabric Held together by a Thermosetting Resin.** R. A. Shroyer, L. P. Gould, and R. E. Moule, all of Dayton, O., assignor to General Motors Corp., Detroit, Mich.

2,351,334. **Tire or Shoe for Automobiles, Airplanes, Etc., Including Two Frames Having Inverted-U Shape, and Rubber Material Surrounding Them.** C. Hannevig, New York, N. Y.

2,351,427. **In a Vibration Damping Mounting, Torque Thrust Receiving Devices Consisting of Inner and Outer Members and between Them a Rubber Closure.** R. C. Henshaw, assignor to Lord Mfg. Co., both of Erie, Pa.

2,351,476. **In an Applicator for a Bottle Top, a Tubular Rubber Member.** H. M. Borden, Minneapolis, Minn.

2,351,767. **Sanitary Rubber Sheet.** J. H. Johnson, Toronto, Ont., Canada.

2,351,777. **Life-Saving Suit.** H. G. Morner, New York, N. Y.

2,351,804. **Waterproof Container Formed of a Rigid Dense Combination of Fibrous Pulp and a Thermoplastic Binder.** J. H. Blum, assignor to The Fibre Forming Corp., Olean, N. Y.

2,351,828. **Surgical Pump.** J. C. Marsh, Pittsburgh, assignor to G. L. Meyers and G. H. Drumheller, Jr., both of Aspinwall, both in Pa.

2,351,906. **Finger Guard.** E. W. Beatty, assignor of one-half to I. W. Millard, both of Danville, Ill.

2,351,957. **Cycle Saddle Support Including a Saddle Pillar, a Rod Enclosed therein, and a Rubber Sleeve Fitted on the Rod.** M. Grivetto, Turin, Italy; vested in the Alien Property Custodian.

2,351,991. **Laminated Transparent Closure Made up of Several Panes of Transparent Material and at Least One Intervening Layer of a Resilient, Deformable and Waterproof Transparent Material Bonded between Adjacent Panes of the First Material so as to Form a Leakproof Gasket.** T. H. McClain, Altadena, assignor to Lockheed Aircraft Corp., Burbank, both in Calif.

2,352,030. **Shock Absorbing Unit Including an Annular Rubber Element.** D. F. Sproul, assignor to J. R. Cardwell, both of Chicago, Ill.

2,352,054. **In a Vehicle Having a Body with a Lower Concave Curved Portion and Chassis Having an Upper Convex Curved Portion, Spaced Rubber Supports for the Body Secured between the Curved Portions to Both Body and Chassis.** K. Wilfert, Sindelfingen, and B. Barenyi, Vaihingen-Rohr, both in Germany; vested in the Alien Property Custodian.

2,352,083. **In a Molding Device, a Matrix Consisting of a Thin-Walled, Hollow Elastic Body.** R. L. Detjen, St. Louis, assignor by mesne assignments to V. R. Stamm, and W. J. and R. O. Bach, all of St. Louis County, doing business as Fixture Products Co., St. Louis, both in Mo.

2,352,128. **One-Piece Sports Suit Including Strips of Elastic Fabric at Sides and Waist.** H. E. Shikles, Jr., Kansas City, Mo.

2,352,148. **In a Shoe an Intermediate Sole Element Including a Flexible and Resilient Matrix of Reinforced, Vulcanized Siccative Oil-Resin Gel.** T. W. Elkin, Jr., Lancaster, and H. C. Stouffer, Manheim Township, assignors to Armstrong Cork Co., Lancaster, both in Pa.

2,352,159. **For an Electric Heater with Metallic Sheath, a Terminal Structure Including an Adapter Member Provided with an Electrical Supply Lead Having a Conducting Member and a Rubber Insulating Cover.** R. E. Brodie, Lanesboro, Mass., assignor to General Electric Co., a Corporation of New York.

2,352,314. **Construction Material Consisting of a Laminated Packing Having a Core Layer of Sponge Rubber.** A. C. Fischer, Chicago, Ill.

2,352,363. **In a Laundry Machine, Rubber Blocks as Mounting for a Washing Unit on Its Support.** R. E. Bassett, Jr., Miami Beach, Fla., assignor by mesne assignments to American Machine & Metals, Inc., East Moline, Ill.

2,352,463. **Adhesive Coated Tape and a Continuous Barrier Coat of Rubber.** E. P. Wenzelberger, Plainfield, and F. N. Manley, Highland Park, assignors to Johnson & Johnson, New Brunswick, all in N. J.

2,352,523. **Apparatus for Artificially Inducing Breathing.** J. H. Emerson, Cambridge, Mass.

2,352,532. **Articulated Wood Sole Connected by Hinge Blocks of Rubber or Resilient Plastic Material.** H. and O. Ghez, both of New York, N. Y.

2,352,533. **In Manufacturing Plywood Tubing, the Use of a Synthetic Resinous Heat-and-Pressure Polymerizable Bonding Agent.** P. R. Goldman, Andover, Mass., assignor to Plymold Corp., Lawrence, Mass.

2,352,586. **Torsion Spring with an Axle Member to Which Is Attached a Sleeve of Resilient Material Circumferentially Subdivided into a Number of Sections.** K. B. Kilborn and S. D. Gehman, assignors to Wingfoot Corp., all of Akron, O.

2,352,591. **Mounting in Which an Annular Gap Formed by Members Spaced Apart Is at Least Partially Bridged by Resilient Material Like Rubber.** L. Wallerstein, Jr., assignor to Lord Mfg. Co., both of Erie, Pa.

Dominion of Canada

420,444. **Rubber Footwear.** G. H. Bingham, Jr., Lincoln, Mass., U. S. A.

420,473. **Dishlike Holder of Plastic Material and Liner therefor Having Stiff Resilient Base.** J. Rosay, Philadelphia, Pa., U. S. A.

420,539. **Abrasive Wheel or Other Abrasive Article Containing Amine Formaldehyde Resin.** Norton Co., Worcester, assignee of L. Coes, Jr., Brookfield, both in Mass., U. S. A.

420,584. **Capsule Consisting of Filling Material Enclosed by a Seamless Wall of Elastic Plastic Material.** O. I. Waring, Flushing, inventor, and P. Rothberg, New York, assignee of one-half the interest, both in N. Y., U. S. A.

420,605. **Advertising Sign Having a Translucent Backing Layer of Resin Material.** W. H. Huntley, San Bernardino, Calif., U. S. A.

420,633. **In Combination, a Liquid Cooled Electric Lamp Including a Tubular Envelope Having at One End a First Contact Terminal and at the Other End a Second Terminal, and also a Base Member of Resilient Rubber between the Second Terminal and the Envelope.** Canadian General Electric Co., Ltd., Toronto, Ont., assignee of W. A. Bourne, Erith, Kent, and H. W. B. Gardiner, Hatch End, Middlesex, both in England.

420,649. **Laminated Structure Bonded with Polyvinyl Alcohol Adhesive.** Canadian Westinghouse Co., Ltd., Hamilton, Ont., assignee of J. G. Ford, Wilkinsburg, Pa., U. S. A.

420,654. **Inflatable Sole Pressing Pad in a Shoe Press.** Compo Shoe Machinery Corp., Boston, assignee of F. Dawson, West Roxbury, both in Mass., U. S. A.

420,658. **Shoe Bottom with Electro-Conductive Rubber-Like Material Extending therethrough.** Dominion Rubber Co., Ltd., Montreal, P. Q., assignee of J. E. Taber, Jr., South Bend, and K. L. Keene, Mishawaka, both in Ind., U. S. A.

420,665. **Pneumatic Tire.** General Tire & Rubber Co., assignee of C. J. Jahant, both of Akron, O., U. S. A.

420,691. **Flexible Power Transmission Coupling Including Two Disks Provided with Integral Lugs Connected in Pairs by Flexible Studs Having a Central Rubber Portion and Metal End Portions Bonded thereto.** Silentbloc, Ltd., assignee of V. A. Trier and S. J. G. Graham, all of London, England.

420,715. **Pneumatic Tire.** Wingfoot Corp., Akron, assignee of J. F. Purdy, Cuyahoga Falls, both in O., U. S. A.

420,717. **Heated, Water-Insoluble Thermoplastic Material along the Edges of Knitted Fabric to Prevent Curling.** M. S. Striker, New York, N. Y., assignee of A. Eddy, Middletown, Conn., both in the U. S. A.

420,810. **Fluid Dispenser.** Gilbert & Barker Mfg. Co., West Springfield, assignee of A. L. Grise, Springfield, both in Mass., U. S. A.

420,811. **Means for Protecting the Leading Edge of an Aircraft Element from Ice Accumulation, Including a Shoe of Rubber-Like Material and a Forward Projecting Fin Formed to Provide an Unstable Advance Seat for Ice.** B. F. Goodrich Co., New York, N. Y., assignee of M. L. Taylor, Ridgewood, N. J., both in the U. S. A.

420,812. **Endless Power Transmission Belt.** B. F. Goodrich Co., New York, N. Y., assignee of B. D. Morgan, Louisville, Ky., both in the U. S. A.

420,817. **Batt of Insulating Material Made of Animal Hair, Rock Wool Fibers, Asphalt, and Rubber.** Johns-Manville Corp., New York, N. Y., U. S. A., assignee of L. J. Papimeau, Montreal, assignee of J. W. Coleman, St. Lambert, P. Q.

420,847. **Electroplating Equipment to Be Subjected to Electrolyte, Including a Part Insulated from the Electrolyte with a Stretched Elastic Tape Consisting Essentially of a Plasticized Copolymer of Vinyl Chloride and Vinyl Acetate.** Union Carbide & Carbon Corp., assignee of Halowax Corp., both of New York, assignee of A. E. Maibauer, Travis, Staten Island, both in N. Y., U. S. A.

420,925. **Thermoplastic Sealing Material Providing an Oil and Grease Leakproof End Seam between a Can Body and a Can End of a Fibrous Container.** American Can Co., New York, N. Y., assignee of R. P. Bigger, Lombard, Ill., both in the U. S. A.

420,929. **For Finishing Textiles, an Aqueous Emulsion of an Alkyd Resin of the Group of Ethylene Glycol Phthalate and Propylene Glycol Phthalate Resins.** American Cyanamid Co., New York, N. Y., assignee of D. W. Light, T. F. Bradley, and A. D. Nute, all of Stamford, Conn., U. S. A.

420,992. **A Strip of Resilient Material as Seal in the Frame of a Double-Sash Window.** Hunter Sash Co., Flushing, assignee of T. J. Colleran, Great Neck, both in N. Y., U. S. A.

420,998. **Pipe Joint Including Bell and Spigot Joint Elements Having Opposing Surfaces Spaced from Each Other and a Rubber Sealing Gasket between the Opposing Surfaces.** Lock Pipe Joint Co., assignee of W. R. Brend, both of East Orange, N. J., U. S. A.

421,021. **Rendering Textile Hose Impervious to Water under Pressure by Filling the Interstices of the Hose with a Sealing Agent Like Rubber Latex.** Sillick Holding Co., Ltd., Newcastle-upon-Tyne 1, Northumberland, assignee of D. E. F. Canney and M. Balkin, both of Bentham, Lancaster, both in England.

421,062. **Shoe Sole Structure Having as Interlayer between an Insole and an Outsole a Thin, Perforated Rubber Sheet.** C. R. Hill, Toronto, Ont.

421,072. **Faucet Coupling with a Resilient Rubber Sleeve Adapted to Be Slipped on the Discharge Spout of a Faucet.** M. F. Mejdrich, Chicago, Ill., U. S. A.

421,127. **Vehicle Suspension Having a Wheel Structure and an Arm Structure; the Arm Structure Includes Cushioning Bodies of Resilient Rubber-Like Material.** B. F. Goodrich Co., New York, N. Y., assignee of A. S. Krotz, Akron, O., both in the U. S. A.

421,177. **Plastic Stop Nut.** Wingfoot Corp., assignee of W. H. Taylor, both of Akron, O., and R. E. Workman, Ravenna, both in O., U. S. A.

United Kingdom

558,628. **Conductive Footwear.** O'Donnell Shoe Co.

558,640. **Windshield Wiper.** Trico Products Corp.

558,673. **Cushion, Shock-Absorber, Vibration Damper, or the Like.** Humber Ltd., A. C. Sampietro, and W. T. Oliver.

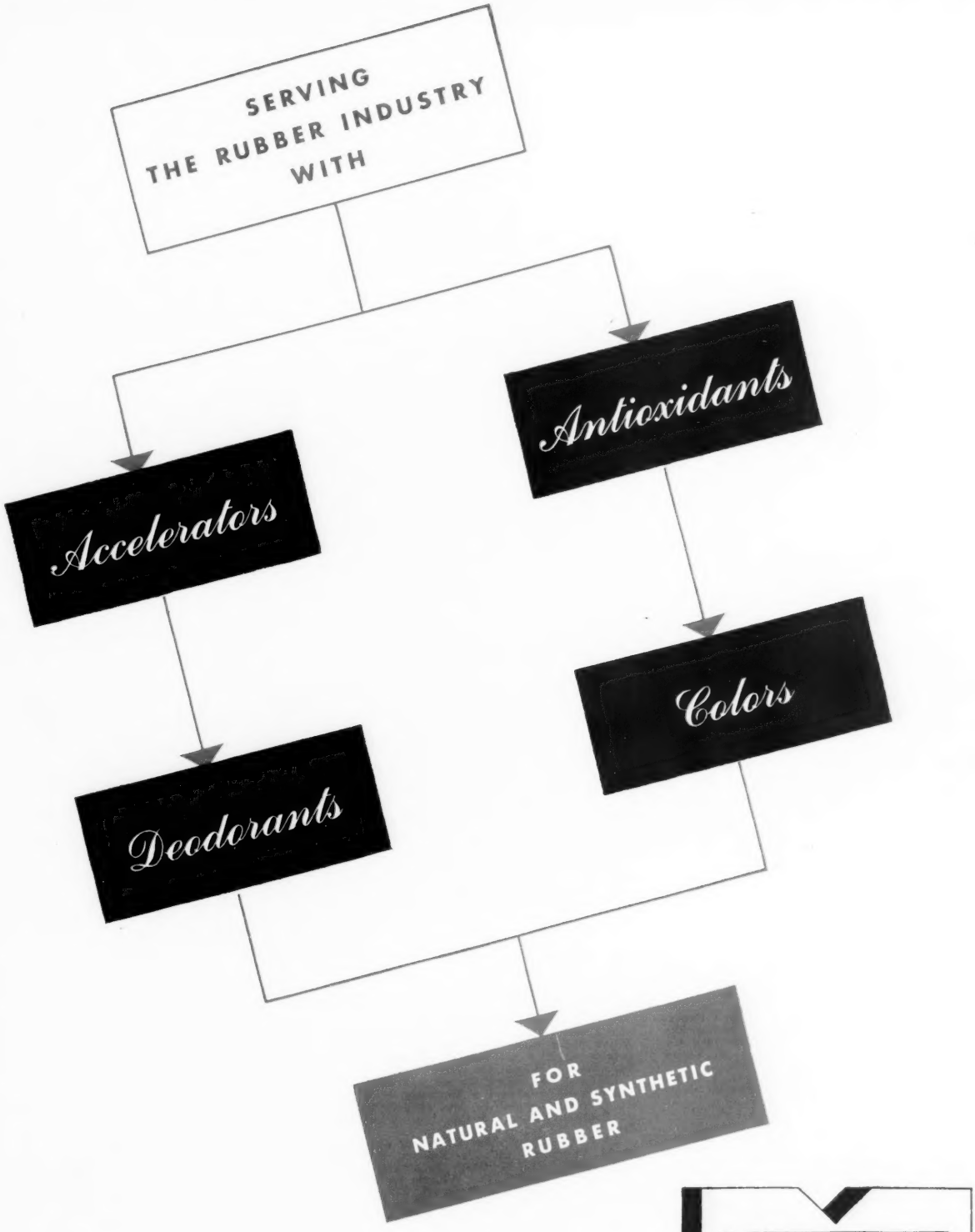
558,691. **Self-Alining Vibration Suspension Mountings for Flexible Devices.** H. N. and P. E. Negretti and H. W. Ibbott.

558,695. **Gaskets and Like Packings.** Protective Metal Finishes, Ltd., and G. Bergstein.

560,718. **Tires for Road Vehicles, Particularly Those for Propulsion by the User, and the Wheels therefor.** H. Bairstow.

560,895. **Packaging Material.** Wingfoot Corp.

560,962. **Device for the Suspension of Articles Such as Dartboards, Etc.** Dunlop Rubber Co., Ltd., and J. Wood.



For details and specifications on any Monsanto Product, or, for technical counsel, please approach MONSANTO CHEMICAL COMPANY, Rubber Service Department, Second National Building, Akron 8, Ohio. Phone: HEmlock 6191.

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561,111. **Hermetic Seals.** Marconi's Wireless Telegraph Co., Ltd.
561,221. **Tires.** N. V. Clarke.
561,248. **Resilient Cushioning Materials.** A. E. Swaine and Firth & Sons, Ltd.

PROCESS

United States

2,350,559. **Forming an Insulation for a Crankcase by Mixing Powdered Vermiculite into a 30% Suspension of Pre-Vulcanized Latex, Spreading This mass on the Surface and Allowing It to Dry.** S. E. Kienitz, New York, assignor to Pentrathane Products, Inc., Long Island City, both in N. Y.

2,351,350. **Laminating Plies of Rubber Hydrochloride Film.** G. D. Mallory, assignor to Wingfoot Corp., both of Akron, O.

2,351,498. **Rough Rubber Coating on Vapor-Permeable Fabric.** D. E. Fowler, Naugatuck, Conn., assignor to United States Rubber Co., New York, N. Y.

2,352,194. **Molding Perforated Material Composed of a Sheet of Rubber on a Sheet of Textile Fabric.** J. A. Grabec, Bratislava, Czechoslovakia; vested in the Alien Property Custodian.

2,351,285. **Phonograph Record Stampers of Plastic Material.** B. A. Proctor, Larchmont, assignor to B. A. Proctor Co., Inc., New York, both in N. Y.

2,352,426. **Rubber Insulated Wire.** H. V. Engh, Irvington, N. Y., assignor to Anaconda Wire & Cable Co., a Corporation of Del.

Dominion of Canada

420,445. **Improvements in Making Rubber Footwear.** G. H. Bingham, Jr., Lincoln, Mass., U. S. A.

420,587. **Shaped Articles from Polyvinyl Compound.** H. Dreyfus, London, assignee of R. P. Roberts and E. B. Johnson, both of Spondon, and M. A. Young, Mangotsfield, Bristol, all in England.

420,720. **Molded and Contoured Sheet Product for Floor Covering from Thermoplastic Material.** Mishawaka Rubber & Woolen Mfg. Co., assignee of G. W. Blair, and J. F. Schott, all of Mishawaka, Ind., U. S. A.

420,867. **Producing Elastic Knitted Fabric on a Circular Knitting Machine.** H. Dreyfus, London, assignee of A. F. Guyler and W. H. Boaler, both of Spondon, both in England.

420,983. **Coating a Fabric with Synthetic Resin.** Dominion Rubber Co., Ltd., Montreal, P. Q., assignee of H. A. Young, Westfield, N. J., U. S. A.

420,984. **Rubber Insole.** Dunlop Tire & Rubber Co., Ltd., Toronto, Ont., assignee of R. C. Davies, Liverpool, Lancaster, England.

421,024. **Producing a Composite Fabric Consisting of a Backing Sheet Formed of a Hydrophilic Colloid Applied to a Layer of Fabric with the Aid of a Thermoplastic Filmforming Material.** Sylvania Industrial Corp., Fredericksburg, Va., assignee of R. Wallach, Briarcliff Manor, N. Y., both in the U. S. A.

421,027. **Treating Fabrics to Obtain a Deposit from an Agglomerated Latex Composition.** United States Rubber Co., New York, N. Y., assignee of H. A. Young, Westfield, N. J., both in the U. S. A.

421,028. **Treating Fabrics to Obtain a Deposit from an Agglomerated Artificial Aqueous Dispersion of Rubber.** United States Rubber Co., New York, N. Y., assignee of H. A. Young, Westfield, N. J., both in the U. S. A.

421,039. **Rubber Playing Balls.** L. A. Young Co., assignee of R. F. Smith, both of Grand Rapids, Mich., U. S. A.

United Kingdom

560,778. **Adhesive Securing of Vinyl Resin Sheet Material to Leather or to Shoe Parts and to Adhesive Compositions Suitable for Use therein.** B. B. Chemical Co., Ltd., (B. B. Chemical Co.).

560,893. **Pneumatic Tires.** Firestone Tire & Rubber Co.

560,934. **Casing of Pneumatic Tires.** Dunlop Rubber Co., Ltd., K. J. Hickin and W. Holroak.

561,052. **Molded Polyamide Articles.** E. I. du Pont de Nemours & Co., Inc.

561,068. **Curing Bags.** Firestone Tire & Rubber Co.

561,115. **Shaped Articles of Polymethylmethacrylate.** W. E. F. Gates and Imperial Chemical Industries, Ltd.

561,152. **Treating Fabrics with Synthetic Resins.** United States Rubber Co.

561,312. **Electric Insulated Wires and Cables.** British Insulated Cables, Ltd., and E. G. L. Roberts.

CHEMICAL

United States

2,350,326. **Resinous Condensation Product Formed by Heating a Mixture Containing Para-Hydroxy Benzoic Acid and a Polyhydric Alcohol.** R. B. Du Vall and E. F. Grether, assignors to Dow Chemical Co., all of Midland, Mich.

2,350,350. Preparing Products of the Formula $(HOCH_2CH_2)\ (OCH_2OCH_2CH_2)_x\ (OCH_2OCH_2CH_2OH)$ Where x Is a Positive Integer from 1 to 2, by Reacting Ethylene Glycol with Formaldehyde in the Presence of a Strong Acid Catalyst, Neutralizing the Catalyst with a Base, and Then Separating the Products from the Reaction Mixture. W. F. Gresham, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,350,366. **Thin Flexible Sheet Material Including a Moistureproof Film Consisting of 3-50% Wax, and as Cementing Material therefor Cyclized Rubber in Which Is Incorporated 0.5% to 50% (Based on the Cyclized Rubber) of Phenol Formaldehyde Piperazine Resin.** J. A. Mitchell, Kenmore, N. Y., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,350,373. **Chlorinating a Light Oil Isoprene Fraction to Prepare 1,2,3,4-Tetrachloro-2-Methyl Butane.** F. J. Soday, Swarthmore, Pa., assignor to United Gas Improvement Co., a corporation of Pa.

2,350,384. **Polymerized Rosin Alcohol.** J. N. Borglin, assignor to Hercules Powder Co., both of Wilmington, Del.

2,350,385. **Sheet Material Coated with Cyclized Rubber Containing a Minor Proportion of Amino Polymer Insoluble in Water and Soluble in Organic Solvents and 2% Acetic Acid.** W. H. Church, Buffalo, N. Y., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,350,400. **Producing Styrene Polymer by Subjecting Monomeric Styrene to Polymerization at a Temperature not Exceeding 125° C. until the Major Portion of the Monomer Has Been Polymerized, Adding an Organic Solvent Which Has a Higher Boiling Point than the Monomer and Is Inert with Respect to the Polymer, Distilling the Resultant Mixture at a Temperature not Substantially above the Polymerization Temperature to Remove as Distillate from the Mixture a Sufficient Portion of the Added Solvent to Insure Simultaneous Removal as Distillate of Substantially All of the Monomeric Styrene Present.** W. A. King, Memphis, Tenn., assignor by mesne assignments to Allied Chemical & Dye Corp., a corporation of N. Y.

2,350,485. **Producing Conjugated Diolefins by Reacting an Olefin of at Least 3 Carbon Atoms to the Molecule, with Formaldehyde in the Presence of Aqueous Sulphuric Acid, and Recovering the Conjugated Diolefins.** E. Arundale, Colonia, and L. A. Mikeska, Westfield, N. J., assignors by mesne assignments to Jasco, Inc., a corporation of La.

2,350,851. **Foils, Tubes, Rods, Etc., from Polyamides.** W. Wehr, Eilenburg, Germany; vested in the Alien Property Custodian.

2,350,861. **Endless Abrasive Belt with End Portions Joined by an Adhesive Which Is the Reaction Product of a Mixture Consisting of a Major Portion of a Water-Soluble Urea Aldehyde Condensation Product and a Minor Proportion of an Alkyd Modifier.** R. T. Argy and C. W. Foss, assignors to Carborundum Co., all of Niagara Falls, N. Y.

2,351,046. **Dyeing Vinyl Polymer Yarns and Other Shapes.** K. Heymann, Meadville, Pa., assignor to American Viscose Corp., Wilmington, Del.

2,351,074. **Improved Polyamide Composition from a Mixture of Different Polyamides, Each of Which Melts below 150° C.** L. F. Salisbury, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,351,090. **Filaments Having a Solid Core of Cellulosic Material and a Sheathing of Rubber.** F. P. Alles, Waynesboro, Va., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,351,102. **Composition Consisting of a Polymeric Vinylidene Chloride Product Plasticized with 5-20% of a Nuclearly Substituted Alpha-Phenyl-Ethyl Phenol Ether Wherein the Substituent Is of the Class of Methoxyl, Chlorine and Phenyl Radicals.** E. C. Britton and F. L. Taylor, assignors to Dow Chemical Co., all of Midland, Mich.

2,351,108. **Producing a Film-Forming Material by Polymerizing for a Time Insufficient to Cause Gelation, Non-Benzenoid Polymers of Acetylene in the Presence of a Mercaptan.** A. M. Collins, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

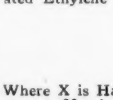
2,351,120. **Products Resulting from the Reaction in the Presence of an Alkaline Catalyst, of an Aldehyde Substance and the Normally Solid Polymers Obtained by Polymerization of Carbon Monoxide with a Polymerizable Organic Compound Containing Ethylene Unsaturation.** W. E. Hanford, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,351,149. **Plastic Compound of Wheat Gluten, Casein, Rubber, and Proteins from Soya Beans, Rice, and Maize.** M. de Becker Remey, Detroit, Mich.

2,351,182. **Open Weave Fabric with Interstices Closed with Individual Films Which Do not Become Sticky When Subjected to a Temperature of 400° F. for Two or Three Minutes; the Films Consist of Polyvinyl Acetate, a 10% Solution of the Polyvinyl Acetate in Equal Part of Ethyl Acetate and Ethyl Alcohol, and over the Films a Coating of a Thermoadhesive Composition.** A. W. Bateman, Newburgh, N. Y., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

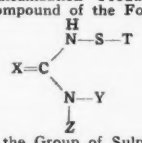
2,351,301. **An Elastic, Rubber-like Molded Article Free from Water, Composed of a Substantially Homogeneous Mixture of a Partial Ester of Polyvinyl Alcohol Wherein 15 to 65% of the Hydroxyl Groups Are Esterified, and a Compound of the Formula $RO(CH_2CH_2O)_nR'$, Where R and R' Are of the Group of Hydrogen and Alkyl Radicals, and n Is an Integer of from 2 to 10.** H. M. Sonnichsen, Niagara Falls, N. Y., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,351,311. **Producing Diene-Synthesis Products by Reacting a Hydrocarbon Compound Containing Two C=C Double Linkages with a Halogenated Ethylene Compound of the Formula**



Where X is Halogen, and R_1 and R_2 Each Represent a Member of the Group of Halogen and Hydrogen; the Reaction Is Performed under Conditions Precluding Any Substantial Polymerization. K. Adler and H. F. Rickert, both of Cologne, Germany; vested in the Alien Property Custodian.

2,351,496. **Vulcanization Product of Rubber Containing a Compound of the Formula**



Where X Is of the Group of Sulphur and Oxygen; T Is a 1-Thiazyl Radical; Y and Z Are Radicals of the Group of Hydrogen, Alkyl, Alkenyl, Aralkyl, Aryl, and Alkylene Radicals of a Heterocylic Ring Embodying the N. W. H. Edelke, Naugatuck, Conn., assignor to United States Rubber Co., New York, N. Y.

2,351,555. **Producing Gas-Expanded Rubber with the Aid of Zinc Diammonia Nitrite.** W. V. Smith, Nutley, N. J., assignor to United States Rubber Co., New York, N. Y.

2,351,556. **Sponge Rubber from Latex.** E. C. Svendsen and W. J. Clayton, Mishawaka, Ind., assignors to United States Rubber Co., New York, N. Y.

2,351,602. **Resinous Composition Including the Product of Reaction of Ingredients Comprising Urea, Melamine, Formaldehyde, and Monochloroacetamide.** G. F. D'Alelio, Pittsfield, Mass., assignor to General Electric Co., a corporation of N. Y.

2,351,658. **Adding a Quaternary Ammonium Compound to a Vinyl Ester-Containing Composition to Inhibit Polymerization of the Vinyl Ester.** A. Berne-Allen, Jr., Waynesboro, Va., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,351,664. **Vinyl and Ethylidene Esters.** F. O. Cockerille, Albemarle County, Va., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,351,716. **As a Liquid Coating Composition, a Smooth Creamy Liquid Suspension of Finely Divided Solid Particles of a Normally Solid Fusible Resin in a Mixture of Water and Liquid Reactive Resin Miscible therewith.** R. L. Smith, assignor to Carborundum Co., both of Niagara Falls, N. Y.

2,351,786. **Producing a Terpene Polymer by Polymerizing an Acyclic Terpene in the Presence of Hydrogen Fluoride.** A. L. Rummelsburg, assignor to Hercules Powder Co., both of Wilmington, Del.

2,351,802. **For Treating Mineral Fibers, a Material Consisting of a Two-Phase System, One Phase Being in the Form of a Water-Solution of a Water-Soluble, Oil-Insoluble Thermosetting, Incompletely Reacted Aldehyde Condensation Product from the Group of Phenol Formaldehyde and Urea Formaldehyde, and the Other Phase Being an Oleaginous Lubricant Incompatible with the Aldehyde Condensation Product, and Emulsified with the Aqueous Phase.** W. M. Bergin, Granville, and A. L. Simison, Newark, both in O., assignors to Owens-Corning Fiberglas Corp., a corporation of Del.

2,351,860. **Extending an Oil Resistant Synthetic Rubber by Mixing with It a Vulcanizable Natural Rubber and an Aryl Guanidine Polysulphide.** J. H. Kelly, Jr., and M. M. Stern, assignors to Dryden Rubber Co., Chicago, Ill.

2,351,998. **Magnesium Oxide.** W. Moschel and W. Forst, both of Bitterfeld, and W. Schmid, Stussfurt, both in Germany; vested in the Alien Property Custodian.

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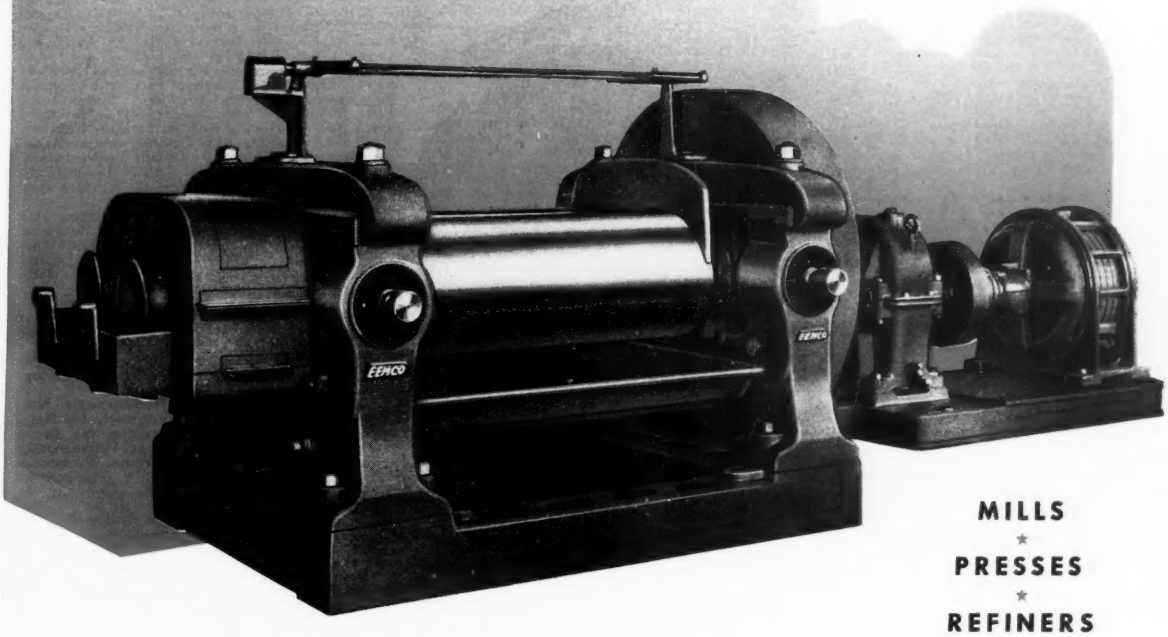

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2,352,070. **Reaction Products of Formaldehyde and a N-Polyalkalylene Polyaminoamide of Malonic Acid; the Amide Has a Reactive Methylene Group.** L. H. Bock, Huntingdon Valley, and A. L. Houk, assignors to Rohm & Haas Co., both of Philadelphia, both in Pa.

2,352,071. **Reaction Products of Formaldehyde and an N-Aminoalkyl Amide of Malonic Acid.** L. H. Bock, Huntingdon Valley, and A. L. Houk, assignors to Rohm & Haas Co., both of Philadelphia, both in Pa.

2,352,263. **Stabilizing Monomeric Vinyl Ester of a Carboxylic Acid by the Addition of Diphenylamine.** F. N. Hopper, Niagara Falls, N. Y., assignor to Niacet Chemicals Corp., a corporation of N. Y.

2,352,268. **Separation of a Butane-Ethyl-Chloride Mixture into Its Component Parts by Means of an Azeotropic Fractional Distillation with Sulphur Dioxide.** C. N. Kimberlin, Jr., Baton Rouge, La., assignor to Standard Oil Development Co., a corporation of Del.

2,352,387. **Condensation Products Consisting of Hexamethylene Diamine with Monomeric Carbonyl Compounds of the Class of Aldehydes and Ketones.** H. Hopff, A. Weickmann, and R. Kern, all of Ludwigshafen-on-the-Rhine, Germany, assignors to General Aniline & Film Corp., New York, N. Y.

2,352,435. **Thioether Containing a Primary Alkyl Radical.** J. M. Hoeffelman and R. Berkenbosch, both of Amsterdam, Netherlands, assignors to Shell Development Co., San Francisco, Calif.

2,352,460. **Manufacturing a Vulcanizable Rubber Reclaim by Mixing Ground Vulcanized Rubber Scrap and 4-10% of a Substance of the Group of Abietic Acid and Sylvic Acid in the Absence of Water and Steam for about One Hour to Two Hours, While Maintaining a Temperature between 140 and 180° C.** A. Treves, assignor by mesne assignments to Rubber & Plastics Compound Co., Inc., both of New York, N. Y.

2,352,515. **Unsaturated Polynitriles Containing at least One β-Cyanoethyl Radical Attached to an Aliphatic Carbon Atom.** H. A. Bruson, assignor to Resinous Products & Chemical Co., both of Philadelphia, Pa.

2,352,525. **Chlorinated Polyvinyl Chloride.** W. J. R. Evans, Blackley, England, assignor to Imperial Chemical Laboratories, Ltd., a corporation of Great Britain.

2,352,573. **Preserving Latex by Adjusting the pH to not Less than 9.8 or More Than 10 and Adding a Small Proportion of a Member of the Class of p-Amino Phenol, Amino-benzoic Acid, 2-Amino-8-Naphthol-6-Sulphonic Acid, and 1-Amino-8-Naphthol-3,6-Disulphonic Acid.** W. D. Stewart, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

Dominion of Canada

419,802. **Polymerization of a Material Containing a Substance from the Group of Furyl Vinyl Ketone and Furyl Isopropenyl Ketone.** Canadian Industries, Ltd., Montreal, P. Q., assignee of E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., assignee of Norton Co., Worcester, Mass., assignee of C. E. Barnes, Belvidere, N. J., all in the U. S. A.

419,804. **Rubberized Fabric Having a Coating of Synthetic Linear Polymer of Intrinsic Viscosity of at Least 0.4 Containing a Plurality of Amide Groups in the Main Chain of Atoms; the Polymer Yields on Hydrolysis with Hydrochloric Acid at Least One Member of the Group of (a) Monoaminomono-Carboxylic Acid Hydrochloride and (b) a Mixture of Dibasic Carboxylic Acid and a Diamine Hydrochloride.** Canadian Industries, Ltd., Montreal, P. Q., assignee of Wilmington Trust Co., Wilmington, Del., U. S. A., executor of the Estate of W. H. Carothers, now deceased, in his lifetime of Wilmington.

419,805. **Preparing a Molding Composition by Polymerizing together Methyl Methacrylate and a Compound of the Group of Styrene, Vinyl Acetate, and Methyl Acrylate.** Canadian Industries, Ltd., Montreal, P. Q., assignee of M. L. Macht, Jersey City, and D. A. Fletcher, Arlington, both in N. J., U. S. A.

419,841. **Composite Product Including a Natural Rubber Composition, and a Rubber-Like Composition Containing a Copolymer of Butadiene and an Alpha-Methylene Carboxylic Acid Nitrile Adhered to the Natural Rubber Composition by Means of a Rubber-Like Composition Containing a Copolymer of Butadiene and an Alpha-Methylene Carboxylic Acid Ester.** B. F. Goodrich Co., New York, N. Y., assignee of D. V. Sarbach, Cuyahoga Falls, O., both in the U. S. A.

419,842. **Composition Consisting of Di-2-Ethylhexyl Phtnalate and a Synthetic Rubber Prepared by Polymerization of a Conjugated Diene.** B. F. Goodrich Co., New York, N. Y., assignee of B. S. Garvey, Jr., Akron, O., both in the U. S. A.

419,843. **For Synthetic Rubber Prepared by Polymerizing a Conjugated Diene, a Softener Having the Structural Formula:**

$$[(R{-}O)_n{-}]_3\ P{=}O$$

Where R Is a Hydrocarbon Group and n an Integer Larger than 1. B. F. Goodrich Co., New York, N. Y., assignee of D. V. Sarbach, Cuyahoga Falls, O., both in the U. S. A.

419,848. **Ethylene Polymer Derivative.** Imperial Chemical Industries, Ltd., London, assignee of J. R. Myles and F. S. Bridson-Jones, both of Northwich, both in England.

419,884. **A Cold Drawing Polyester Stabilized with a Non-Alkaline Antioxidant Substance.** Western Electric Co., Inc., assignee of Bell Telephone Laboratories, both of New York, N. Y., assignee of J. B. Howard, Summit, N. J., both in the U. S. A.

419,885. **A Cold Drawing Polyester Which Resists Molecular Degradation When Exposed to the Atmosphere at Temperatures above Its Melting Point, the Condensation Linkages of Which Consist Essentially of the Formula** $C{-}O$ (with $=O$ above the C) **Polyester Having Substantially All of Its Hydroxyl Groups Converted by Esterification to Ester Groups of the Formula** $-O-C-R$ (with $=O$ above the C) **Where R Is a Hydrocarbon Radical.** Western Electric Co., Inc., assignee of Bell Telephone Laboratories, Inc., both of New York, N. Y., assignee of C. S. Fuller, Chatham, N. J., both in the U. S. A.

419,963. **Cork Particles Coated with a Binder of Resinous Compound in an Intermediate Stage of Phenol and Formaldehyde Reacted in the Presence of Propylene Glycol.** Crown Cork & Seal Co., Inc., assignee of G. B. Cooke and M. S. Ebert, all of Baltimore, Md., U. S. A.

420,023. **Glass Substitute Formed of Wire Gauze or the Like to Which Is Applied a Solution of Incompletely Polymerized Synthetic Resin; the Solvent Is Later Freed from the Resin, and the Resin Then Further Polymerized to Render It Stable.** C. Garrett, Perth, Scotland.

420,053. **Dehydrating and Preserving a Solid, Hydrous Resinophoric Material Containing a Substantially Unpolymerized Triazine-Aldehyde Condensation Product.** American Cyanamid Co., New York, N. Y., U. S. A., assignee of P. P. McClellan, Old Greenwich, Conn., U. S. A.

420,098. **Cellular Soft Vulcanized Rubber.** Dominion Rubber Co., Ltd., Montreal, P. Q., assignee of G. R. Cuthbertson, Passaic, N. J., U. S. A.

420,099. **Gas-Expanded Rubber Products.** Dominion Rubber Co., Ltd., Montreal, P. Q., assignee of G. R. Cuthbertson, Detroit, Mich., U. S. A.

420,105. **Treating a Protein Material with a Relatively Strong Acid and Then with a Condensing Agent to Produce a Plastic Product with Materially Reduced Water Absorption.** General Mills, Inc., Minneapolis, Minn., assignee of Institute of Paper Chemistry, assignee of J. R. Coffman and H. F. Lewis, both of Appleton, Wis., both in the U. S. A.

420,203. **Improved Rutile Titanium Oxide Pigment.** Canadian Industries, Ltd., Montreal, P. Q., assignee of J. L. Keats and H. M. Stark, both of Wilmington, Del., U. S. A.

420,231. **Converting Barton Litharge to Pure Red Litharge.** General Motors Corp., Detroit, Mich., assignee of R. L. Seabury and R. A. Daily, both of Muncie, Ind., U. S. A.

420,275. **Closed-Cell Expanded Rubber.** Rubatex Products, Inc., New York, N. Y., assignee of L. Cooper, Monson, Mass., both in the U. S. A.

420,276. **Gas-Expanded Closed-Cell Rubber.** Rubatex Products, Inc., New York, assignee of R. C. Bascom, Merrick, both in N. Y., U. S. A.

420,277. **Forming a Vulcanized Cellular Rubber Product.** Rubatex Products Inc., assignee of D. Roberts, both of New York, N. Y., R. C. Bascom, Port Clinton, O., and Lester Cooper, Milford, Conn., all in the U. S. A.

420,278. **Closed-Cell Gas-Expanded Rubber.** Rubatex Products, Inc., assignee of D. Roberts, both of New York, N. Y., and L. Cooper, Monson, Mass., both in the U. S. A.

420,342. **Preparing Anti-Halation Backings for Photographic Supports Which Includes Mixing a Carbon Pigment with a Water-Insoluble, Alkali-Soluble, Polyvinyl Resin.** Canadian Kodak Co., Ltd., Toronto, Ont., assignee of N. L. Simmons, Rochester, N. Y., U. S. A.

420,371. **Treating Yarns and Fabric with a Water Soluble Alkyd Resin.** Cosmos Imperial Mills, Ltd., assignee of B. Monsaroff, both of Hamilton, Ont.

420,492. **Preparing 2,2,3-Trichlorobutane by Chlorinating 2-Chloro-Butene-2 in the Substantial Absence of Light in the Liquid Phase at a Temperature of 0° C. to the Atmospheric Reflux Temperature of the Reaction Mixture, in the Presence of Stannic Chloride.** Canadian Industries, Ltd., Montreal, P. Q., assignee of A. A. Levine and O. W. Cass, both of Niagara Falls, N. Y., U. S. A.

420,493. **Preparing 2-Chloro-Butene-2 by Contacting Vapors of 2,3-Dichlorobutane with Barium Chloride at a Temperature of 200° to 300° C.** Canadian Industries, Ltd., Montreal, P. Q., assignee of A. A. Levine and O. W. Cass, both of Niagara Falls, N. Y., U. S. A.

420,498. **Intimate Mixture of a Protein and a Synthetic Linear Polyamide.** Canadian Industries, Ltd., Montreal, P. Q., assignee of G. deW. Graves, Wilmington, Del., U. S. A.

420,501. **Water-Insoluble, Completely Aliphatic Resinous Product Consisting Essentially of the Product of the Condensation of Formaldehyde with Semicarbazide.** Canadian Industries, Ltd., Montreal, P. Q., assignee of F. L. Johnston, Claymont, Del., U. S. A.

420,503. **Treating a Web of Paper-Making Fibers with an Aqueous Solution of Polyvinyl Alcohol and a Water-Soluble N-Methylol Aliphatic Compound.** Canadian Industries, Ltd., Montreal, P. Q., assignee of G. L. Schwartz, Wilmington, Del., and J. F. Walker, Lewiston, N. Y., both in the U. S. A.

420,514. **Distilling a Mixture of Butylene-1 and Isobutylene in the Presence of Sulphur Dioxide to Effect at Least Partial Separation of the Isomeric Butylenes from One Another.** Dow Chemical Co., assignee of E. C. Britton, H. S. Nutting, and L. H. Horsley, all of Midland, Mich., U. S. A.

420,519. **Imparting Permanent Water-Repellence to Textile Material by Combining It under Reaction Conditions with a Reaction Product Containing Ammonia-Formaldehye and Aliphatic-Acid-Halide Groups with at Least Ten Carbon Atoms Contained in a Saturated Radical.** Heberlein Patent Corp., New York, N. Y., U. S. A., assignee of E. Wolf, Krefeld, Germany.

420,535. **Sealing the Metallic part of an Electrical Fitting to a Ceramic Part with Styrene Polymerized *in Situ*.** Northern Electric Co., Ltd., Montreal, P. Q., assignee of T. R. Scott and L. A. C. Pooley, both of London, England.

420,689. **Reacting Allyl Chloride with an Aqueous Ammonia Solution to Obtain Predominantly the Primary Allyl Amine.** Shell Development Co., San Francisco, assignee of W. Converse, Berkeley, both in Calif., U. S. A.

420,694. **Molding Composition Consisting of a Polymer Substance of Isobutylene and Butadiene Compounded with Sulphur and a Resistant Filler Material.** Standard Oil Development Co., Linden, N. J., assignee of I. E. Lightbown, Elizabeth, N. J., and W. J. Sparks, Alexandria, Va., all in the U. S. A.

420,725. **Producing Polymerization Products from Ethylene by Carrying out the Polymerization in an Aqueous Dispersion in the Presence of a Substance Suppling Oxygen.** H. Hopff, S. Goebel, and C. W. Rautenstrauch, all of Ludwigshafen-on-the-Rhine, Germany.

420,765. **Polymerizing a Homogeneous Mixture Including a Plurality of Polymerizably Reactive Organic Substances Containing the Group** $CH_2{=}C{<}$ **and a Resin Containing Polymerizably Reactive Alpha, Beta Enal Groups.** American Cyanamid Co., New York, N. Y., assignee of E. L. Kropa, Stamford, Conn., both in the U. S. A.

420,766. **Preparing Alkylated Amino-Triazine-Formaldehyde Condensation Products.** American Cyanamid Co., New York, N. Y., assignee of R. C. Swain, Riverside, and P. Adams, Stamford, both in Conn., both in the U. S. A.

420,800. **Impregnating Compound Composed of Zein, a Phenol-Formaldehyde Resin in Its Alcohol Soluble State, a Common Alcoholic Solvent of the Zein and Resin, and an Aromatic Hydrocarbon Solvent of the Group of Benzol, Toluol and Xylol.** Corn Products Refining Co., New York, N. Y., assignee of O. C. H. Sturken, Closter, N. J., U. S. A.

420,827. **Improving Bituminous Paving or Surfacing Material by Incorporating an Unresinified Organic Resin-Forming Material.** Quaker Oats Co., Chicago, Ill., assignee of H. F. Winterkorn, Columbia, Mo., both in the U. S. A.

420,835. **Closed Cell Gas-Expanded Rubber.** Rubatex Products, Inc., New York, N. Y., assignee of H. Pfleumer, New Brunswick, N. J., U. S. A.

420,855. **Shrinkable Article from a Sol Consisting of an Organic Plastic Material Dissolved in a Liquid Which Is a Solvent for the Plastic Material Only at Elevated Temperature; the Sol upon Being Cooled Is Capable of Becoming Instantly a Gel with Substantially All the Liquid Retained by the Plastic Material and Accompanied by Syneresis.** United Shoe Machinery Co. of Canada, Ltd., Montreal, P. Q., assignee of A. E. Ushakoff, Beverly, Mass., U. S. A.

420,905. **Solutions of Urea-Formaldehyde Condensate Which Form Stable Mixtures with Oil Acid-Modified Alkyd Resins.** Libbey-Owens-Ford Glass Co., Toledo, O. assignee of I. Rosenblum, New York, N. Y., both in the U. S. A.

421,002. **Treating Tall Oil to Separate the Fatty Acid Components from the Resinic Acid Components.** National Oil Products Co., Harrison, assignee of E. Segessemann, Newark, both in N. J., U. S. A.

421,044. **Paints, Varnishes, and Enamels Consisting of a Volatile Solvent, Pigments, Resins, and in Complete Solution with the Volatile Solvent together and Compatible with the Dissolved Resin; the Wax-Like Polymeric Vinyl Ether of the Alcohols Corresponds in the Number of Carbon Atoms to the Acids in Montan Wax in an Amount not Exceeding 13% by Weight of the Resin.** S. C. Johnson & Son, Inc., assignee of W. P. Lawler, G. J. Hable, and J. V. Steinle, all of Racine, Wis., U. S. A.

421,087. **Rubber Compounded with a Coal-Tar Oil.** Allied Chemical & Dye Corp., assignee of Barrett Co., both of New York, N. Y., assignee of T. A. Bulifant, Hackensack, N. J., both in the U. S. A.

421,088. **Compounding Rubber with the Addition of Aromatic Base Material Involving a Ni-**

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trogen-Containing Ring; the Base Material Boiling at 210° C. Allied Chemical & Dye Corp., assignee of Barrett Co. (by its trustees on dissolution), both of New York, N. Y., assignees of T. A. Bulifant, Hackensack, N. J., U. S. A.

421,103. **Adhesive Coating Material Consisting of a Plasticized Resinous Substance Having an Affinity for Cellulose Material, Plasticized Crepe Rubber, and Paraffin Wax.** Canada Foils, Ltd., assignee of C. P. Olstad, both of Toronto, Ont.

421,176. **Composition of a Synthetic Rubber of the Group of Chlorobutadiene Polymers, Organic Polysulphide Plastics, Isobutylene Polymers and Butadiene-Acrylonitrile Copolymers and Cyclized Rubber.** Wingfoot Corp., Akron, assignee of H. R. Thies, Kent, both in O., U. S. A.

421,179. **Plasticizing Chlorinated Rubber by Incorporating an Ester of Tri-Carballylic Acid.** E. Higgins, inventor, and M. C. Meyer, assignee of 50% of the interest, both of New York, N. Y., U. S. A.

United Kingdom

558,556. **Condensation Products.** Society of Chemical Industry in Basle.

558,617. **Coating Compositions.** E. I. du Pont de Nemours & Co., Inc., and M. E. Cupery.

558,652. **Synthetic Resinous Molding Compositions.** British Thomson-Houston Co., Ltd.

558,654. **Modified Phenol-Aldehyde Resinous Condensates and Compositions Comprising the Condensates.** British Thomsom-Houston Co., Ltd.

558,656. **Resinous Compositions.** British Thomson-Houston Co., Ltd.

558,683. **Dialkyl Ethers of Dimethylol Urea.** British Industrial Plastics, Ltd.

559,890. **Heterocyclic Compounds.** United States Rubber Co.

559,942. **Plastic Compositions.** Monsanto

559,957. **Acrylic Acids, Heterocyclic Acrylic** Chemical Co.

Acids, Aryl Alkenes, and Heterocyclic Alkenes. E. I. du Pont de Nemours & Co., Inc.

560,093. **Foraminous Plastic Material.** L. H. P. and A. H. Jarrard, (legal representatives of W. J. Jarrard).

560,166. **Oxidation of Acrolein to Acrylic Acid.** Distillers Co., H. P. Staudinger, and K. H. W. Tuerck.

560,448. **Water Repellents and Treatment of Textiles therewith.** G. M. Clark, (Warwick Chemical Co.).

560,454. **Rubber Hydrochloride Films.** Wingfoot Corp.

560,492. **Recovery of Cellulose and Lignin.** R. H. McKee.

560,528. **Polymeric Substances.** Standard Oil Development Co.

560,748. **Plasticizing Amino-Aldehyde Resins.** British Industrial Plastics, Ltd., (American Cyanamid Co.).

560,753. **Volume Stabilized Acid Absorbing Resin.** Resinous Products & Chemical Co.

560,777. **Interpolymers of Butadienes with Halogenated Vinyl Compounds.** Wingfoot Corp.

560,784. **Polymeric Compounds.** H. Dreyfus.

560,785. **Highly Polymeric Compounds.** H. Dreyfus.

560,786. **Highly Polymeric Organic Compounds.** H. Dreyfus.

560,808. **Adhesive Compositions.** B. B. Chemical Co., Ltd., (B. B. Chemical Co.).

560,811. **Compounds of Cyclopentanopolyhydrophenanthrene Series.** T. Reichstein.

560,812. **New Compounds of Cyclopentanopolyhydrophenanthrene Series.** T. Reichstein.

560,907. **Surface Active Rosin Derivatives.** National Oil Products Co.

560,924. **Polymers.** Standard Oil Development Co.

560,940. **Resilient Material Having a Basis of Regenerated Cellulose or a Cellulose Ester.** British Celanese Ltd.

560,958. **Antioxidants.** United States Rubber Co.

560,980. **Polymerization Process.** Standard Oil Development Co.

561,002. **Alkyl Derivatives of Branched Paraffins.** A. L. Mond, (Universal Oil Products Co.).

561,044. **Resinous Condensation Products.** British Thomson-Houston Co., Ltd.

561,045. **Synthetic Resinous Materials.** British Thomson-Houston Co., Ltd.

561,076. **Synthetic Resins.** British Thomson-Houston Co., Ltd.

561,077. **Resinous Condensation Products.** British Thomson-Houston Co., Ltd.

561,081. **Thermosetting Resinous Cellulosic Compositions and Articles for Building Purposes.** J. F. Stable and Cyproc Products, Ltd.

561,104. **Ester-Amide Polymers.** E. I. du Pont de Nemours & Co., Inc., and R. E. Christ.

561,108. **Polyesteramides.** E. I. du Pont de Nemours & Co., Inc., and R. E. Christ.

561,184. **Rosin Derivatives.** National Oil Products Co.

561,186. **Melamine.** British Industrial Plastics, Ltd., (American Cyanamid Co.).

561,197. **Hydrocolloid Molding Composition and Material for Use therein.** Surgident, Ltd.

561,198. **Sealing Compositions.** P. A. H. Goldsmith and Heaters, Ltd.

561,223. **Sulphonamides of the Pyridine Series.** H. de Laszlo and R. Banmeyer.

561,232. **Synthetic Resinous Products.** British Thomson-Houston Co., Ltd.

561,240. **Plastics.** H. Dreyfus, J. H. Rooney, and B. Shaw.

561,262. **Treatment of Vulcanized Rubber.** J. H. Ritchie and L. Levinovitsch.

561,327. **Resinous Condensation Products.** British Thomson-Houston Co., Ltd.

MACHINERY

United States

2,347,780. **Apparatus for Assembling Resilient Joints.** O. E. Hermanns, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,347,816. **Machine for Making Cemented Pile Carpet.** H. P. Faris, Philadelphia, Pa., and J. E. White, Trenton, N. J., assignors to National Automotive Fibres, Inc., Detroit, Mich.

2,347,952. **Tire Vulcanizer.** H. V. James, Denver, Colo.

2,348,229. **Apparatus for Use in Vulcanizing Tires, Consisting of a Tubular, Expansible Bag, Means for Introducing Fluid under Pressure within the Bag, and Means to Prevent Elongation of the Bag during Expansion.** C. M. Semler, Cuyahoga Falls, O.

2,348,289. **Apparatus to Apply Liquid to Strip Material.** R. B. Frost, Rutherford, N. J., assignor to United States Rubber Co., New York, N. Y.

2,348,591. **Die for Skinning Thermoplastic Shapes.** J. Bailey, West Hartford, assignor to Plax Corp., Hartford, both in Conn.

2,348,677. **Mold for Use in Preparing Resinous Objects by Polymerizing Resin-Forming Liquid.** R. D. Freeman, assignor to Dow Chemical Co., both of Midland, Mich.

2,349,176. **Machine for Extruding and Blowing Plastics.** W. H. Kopitke, West Hartford, assignor to Plax Corp., Hartford, both in Conn.

2,349,977. **Molding Device for Producing Combs from Plastic, Etc.** L. Mazzoni, Lyon, France; vested in the Alien Property Custodian.

2,350,175. **Combination of a Mold and Vulcanizer with Separable Parts.** E. A. Luxenberger, assignor to Mishawaka Rubber & Woolen Mfg. Co., both of Mishawaka, Ind.

2,350,238. **Machine for Trimming the Flash from Rubber Heels, Etc.** C. S. Knight, assignor to G. Knight & Co., both of Brockton, Mass.

2,350,375. **Tire Groover.** P. Stephens, assignor of 25% to L. L. Brantley, both of Nacogdoches, Tex.

2,350,539. **Injection Molding Machine and Automatic Temperature Control Therefor.** G. Smith, Cambridge, assignor to Reed-Prentice Corp., Worcester, both in Mass.

2,350,772. **Device for Longitudinally Covering Electric Conductors with Artificial Plastic and Insulating Material of Great Tenacity.** F. Klute and H. Heering, both of Berlin-Charlottenburg, Germany; vested in the Alien Property Custodian.

2,351,200. **Valve Treating Machine.** E. D. George, Ridley Park, Pa., and H. M. Brown, Cuyahoga Falls, O., assignors to Wingfoot Corp., Wilmington, Del.

2,351,202. **Apparatus for Manufacturing Thin Rubber Goods by the Dipping Process.** F. E. Hahne, assignor to Chemical Enterprises, Inc., both of New York, N. Y.

2,351,329. **Apparatus for Making Rubber Torsion Bushings, Etc.** J. H. Gerstenmaier, St. Marys, assignor to Wingfoot Corp., Akron, both in O.

2,351,404. **Apparatus for Applying Patches from Patch Material.** R. S. Colley, Kent, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,351,774. **Plastic Injection Machine.** L. P. McGowen, Detroit, assignor to Ford Motor Co., Dearborn, both in Mich.

2,351,861. **Continuous Vulcanizer.** T. M. Knowland, Belmont, and W. C. Bleher, Boston, assignors to Boston Woven Hose & Rubber Co., Cambridge, all in Mass.

2,351,981. **Device for Molding Gas Masks.** E. J. A. Lejeune, Paris, France; vested in the Alien Property Custodian.

2,352,055. **Apparatus for Making Tire Carcasses.** E. W. Witt, Windsor, Victoria, Australia.

2,352,571. **Thickness Measuring Apparatus.** E. A. Sprigg, Wadsworth, O., assignor to B. F. Goodrich Co., New York, N. Y.

Dominion of Canada

419,381. **Machine to Mold Hollow Plastic Bodies.** G. R. Kelm, Paterson, N. J., U. S. A.

419,462. **Rolling Extruder for Plastics.** Proctor & Schwartz, Inc., assignee of F. E. Hurxthal and J. J. Franklin, all of Philadelphia, Pa., U. S. A.

419,882. **Apparatus for Delivery of Regulated Quantities of a Liquid in Which Fine Particles of Solid Material Are Suspended.** United States Rubber Co., New York, N. Y., assignee of E. H. Clark, Mishawaka, Ind., both in the U. S. A.

419,883. **Apparatus for Applying Liquid Latex or the Like to Wire, Etc.** United States Rubber Co., New York, N. Y., assignee of F. S. Bartlett, Bristol, R. I., both in the U. S. A.

420,001. **Machine for Making Cemented Pile Fabric.** E. B. Allen, Birmingham, assignee of D. P. Allen, Detroit, both in Mich., administrator of the estate of R. S. Allen, deceased, in his lifetime of Birmingham, Mich., assignee of P. Smith, Rockford, Ill., both in the U. S. A.

420,112. **Tire Building Drum and Tire Strip Feeding Apparatus.** Lee Rubber & Tire Corp., Conshohocken, assignee of J. C. Carlin, Norristown, both in Pa., U. S. A.

420,155. **Tire Vulcanizer.** D. Boyd and H. E. Fenner, both of Eau Claire, Wis., U. S. A.

420,394. **Machine for Making Cemented Pile Carpet.** National Automotive Fibres, Inc., Detroit, Mich., assignee of H. P. Faris and J. E. White, both of Trenton, N. J., both in the U. S. A.

420,927. **Machine for Applying Thermoplastic Adhesive in Fluid Form to Web Material.** American Can Co., New York, N. Y., assignee of R. E. J. Nordquist, Maplewood, N. J., both in the U. S. A.

United Kingdom

558,620. **Injection Molding Machine for Plastic Substances.** Ford Motor Co., Ltd.

558,649 and 558,677. **Apparatus to Make Dipped Goods.** H. G. C. Fairweather, (Chemical Enterprises, Inc.).

559,713. **Machine for Straining Stock for Use in the Rubber and Plastics Industries.** W. T. Henley's Telegraph Works Co., Ltd., and F. T. Griffiths.

560,105. **Extrusion Molding Machine.** H. Reedman.

560,147. **Mold Structures for Molding Rubber Syringe Bulbs.** G. R. Kelm.

560,290. **Apparatus for Making Cemented Pile Fabric.** R. S. Allen.

560,475. **Means and Method of Producing Moldings of Plastic Material.** R. Pollak.

560,476. **Extruders.** Henley's Telegraph Works Co., Ltd., and F. T. Griffiths.

561,324. **Apparatus for Low-Temperature Polymerization.** Standard Oil Development Co.

UNCLASSIFIED

United States

2,347,767. **Tire and Wheel Lock.** F. C. Burrell, Lyons, Ill.

2,347,925. **Air Seal Compositions for Pneumatic Tires.** N. Owens, Chanute, Kan., assignor to Film-O-Seal Co.

2,348,084. **Package Including a Tire Casing and Tire Cover.** C. M. MacChesney, Chicago, and A. B. Wilson, Evanston, assignors to Acme Steel Co., Chicago, both in Ill.

2,348,256. **Removable Tire Cover.** H. L. Hollis, Chicago, Ill.

2,348,550. **Wheel.** H. T. Kraft and J. I. Kozopas, assignors to General Tire & Rubber Co., all of Akron, O.

2,348,692. **Hose Reel.** J. A. Jensen, Philadelphia, Pa., assignor to C. E. Frick, J. R. McCoy, J. H. Jensen, E. F. Davis, executor and ancillary executor under the will of G. M. Heller, deceased, G. B. Frick, Jr., G. D. Whyte, and F. J. Stackpole, co-partners trading under the name of Philadelphia Valve Co., Philadelphia, Pa.

2,348,811. **Tire Carrier.** R. S. Hartman, Trenton, N. J.

2,349,067. **Protecting Device for Tires of Aircraft Landing Wheels.** J. Wright and H. Trevaskis, Hampton Lane, Solihull, assignors to Dunlop Rubber Co., Ltd., London, both in England.

2,349,249. **Apparatus for the Recovery of Solvent.** G. E. Desetti, Woodbury, N. J., and W. A. Dew, B. H. Mackey, and R. G. Woodbridge, Jr., assignors to E. I. du Pont de Nemours & Co., Inc., all of Wilmington, Del.

2,349,288. **Tire Balance Tester.** J. P. Lannen, Detroit, Mich.

2,349,538. **Hose Clamp.** A. P. Craig, Morgan Hill, assignor to Food Machinery Corp., San Jose, both in Calif.

2,349,552. **Wheel Balancer.** H. G. Holmes, Lansing, Mich., assignor to Food Machinery Corp., San Jose, Calif.

2,349,594. **Vacuum Method of Filling Tires and Inner Tubes with Liquid.** W. W. McMahan, assignor to Wingfoot Corp., both of Akron, O.

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2,349,794. **Resilient Automobile Wheel.** V. J. Stewart, Tallahassee, Fla.

2,351,601. **The Combination with an Automotive Vehicle of a Housing Mounted Forwardly of a Wheel of the Vehicle, a Skid Chain Arranged within the Housing and Means for Applying the Skid Chain.** R. Dabbs, Pittsburgh, Pa.

2,351,655. **Means for Removably Securing Ornamental Wheel Trim Disks.** C. B. Aske, Jr., Detroit, Mich.

2,351,990. **Apparatus to Convey Ring-Shaped Articles.** H. C. Matlock, Bridgeport, Conn., assignor to United States Rubber Co., New York, N. Y.

2,352,174. **Antiskidding Device.** D. S. Barrows, assignor to Symington-Gould Corp., both of Rochester, N. Y.

2,352,464. **Tire Guard for Straddle Trucks.** C. L. Aerni, Ferriday, La.

Dominion of Canada

419,823. **Insulation Testing Equipment.** Canadian Westinghouse Co., Ltd., Hamilton, Ont., assignee of J. H. Frakes, Pittsburgh, and G. C. Saltzman, Wilkinsburg, both in Pa., U. S. A.

419,972. **Fastener for Anchorage in an Aperture.** B. F. Goodrich Co., New York, N. Y., assignee of R. H. Gill, Akron, O., both in the U. S. A.

420,028. **Non-Skid Device.** D. S. Kennedy, Andover, Hampshire, England.

420,095. **Valve for Inflatable Boats.** Dill Mfg. Co., Cleveland, assignee of J. C. Crowley, Cleveland Heights, both in O., U. S. A.

420,111. **Complete Wrapping and Sealing of First Aid Units.** Johnson & Johnson, Ltd., Montreal, P. Q., assignee of H. Ganz, Ridgefield Park, N. J., U. S. A.

420,306. **Vehicle Wheel.** L. A. Douglas, Windsor, Ont.

420,457. **Tire Safety Valve.** F. Gerin-Lajoie, Louiseville, P. Q.

420,485. **Machine for Stripping a Rubber Block from a Rectangular Metal Frame of a Tread Link or the Like.** Burgess-Norton Mfg. Co., Geneva, assignee of R. A. Sandberg, Waukegan, both in Ill., U. S. A.

420,677. **Liner for Adherent Rubber Surface.** Minnesota Mining & Mfg. Co., assignee of W. Kellgren and W. D. Hurd, all of St. Paul, Minn., U. S. A.

420,832. **Hose Coupling.** Resistoflex Corp., Belliville, assignee of W. MacWilliam, Nutley, and F. W. Thiemann, Bloomfield, all in N. J., U. S. A.

421,009. **Tube Coupling.** Parker Appliance Co., assignee of A. L. Parker, both of Cleveland, O., U. S. A.

United Kingdom

559,977. **Bead Locks for Tire and Rim Assemblies of Wheels.** Firestone Tire & Rubber Co.

560,342. **Electric Cable Joints.** British Insulated Cables, Ltd., and W. Holttum.

560,956. **Apparatus to Test the Balance of Rotating Bodies.** J. J. Guest.

561,046. **Cleaning Articles of Magnesium or Magnesium Alloys.** Wingfoot Corp.

561,283. **End Fittings for Flexible Hose.** Automotive Products Co., Ltd., R. J. Fisher and W. H. J. Brock.

561,225. **Collapsible Containers for Liquids, Creams, Etc., and the Products Obtained thereby.** Dunlop Rubber Co., Ltd., J. Rogerson and F. W. Warren.

TRADE MARKS

United States

407,406. **Hub.** Adhesives. United Shoe Machinery Corp., Boston, Mass.

407,499. **Bulldozers.** Footwear. Charles A. Eaton Co., Brockton, Mass.

407,523. **Geon.** Polyvinyl resins. B. F. Goodrich Co., New York, N. Y.

407,529. Representation of a black circle cut horizontally through the center by a broad white band containing the word: **"Miracryl."** Acrylic denture base material. Motloid Co., Inc., Chicago, Ill.

407,630. Representation of the word: **"Serviseal"** with a horizontal line drawn over it. Belts. Gates Rubber Co., Denver, Colo.

407,673. **Rep.** Water repellent for use on fabrics. R. R. Street & Co., Inc., Chicago, Ill.

407,704. **Etonic Arch.** Footwear. Charles A. Eaton Co., Brockton, Mass.

407,705. **Power to boot.** Footwear, Charles A. Eaton Co., Brockton, Mass.

407,724. **Pantone.** Coated textile fabrics. Pantasote Leather Co., Passaic, N. J.

407,778. Representation of a winged bug riding on a tube and holding in one hand a bell and in the other an instrument with the number **"1234"** on it. Apparatus for testing insulating coatings. D. E. Stearns, Shreveport, La.

407,803. **Maximus.** Sporting goods. B. F. Goodrich Co., New York, N. Y.

407,808. **Acryvelum.** Acrylic materials for denture liners. H. D. Justi & Son, Inc., Philadelphia, Pa.

407,818. Representation of a black rectangle containing in the center a candle flame and on either side of that the words: **"Duz"** and **"All."** Dental material. Coralite Dental Products Co., Chicago, Ill.

FINANCIAL

Eagle-Picher Lead Co., Cincinnati 1, O. Six months to May 31: net profit, $1,039,287, equal to $1.15 a common share, contrasted with $1,170,215, or $1.29 a share, in the 1943 period; net sales $24,625,159, against $21,278,942.

Endicott Johnson Corp., Endicott, N. Y., and subsidiaries. Year ended May 27, 1944: net profit, $2,203,672, against $2,364,704 in the previous 52 weeks; net sales, $91,975,511, against $104,014,132; taxes, $5,107,500, against $6,600,000; reserve for contingencies, $150,000, against $750,000.

Firestone Tire & Rubber Co., Akron, O., and subsidiaries. Six months ended April 30, 1944: net profit, $6,626,652, equal to $2.88 a share on the outstanding common stock, compared with $6,387,797, or $2.60 a share, in the corresponding period a year ago; reserve for taxes, $18,130,484; additional reserve for contingencies, $2,500,000.

General Electric Co., Schenectady, N. Y. First half, 1944: net profit, $20,770,700, equal to 72¢ a common share, against $21,061,629, or 73¢ a share, in the 1943 period; net sales, $693,070,838, against $626,871,716.

Hercules Powder Co., Wilmington, Del., and subsidiaries. First half, 1944: net earnings, $2,182,174, equal, after preferred dividends, to $1.46 a common share, against $2,726,789, or $1.86 a common share, in the first six months last year.

Philips Petroleum Co., Bartlesville, Okla., and subsidiaries. First half, 1944: net profit, $9,004,538, equal to $1.83 each on 4,916,987 common shares outstanding, against $7,345,315, or $1.62 each on 4,520,920 common shares, in the first six months of 1943.

Sun Oil Co., Philadelphia, Pa., and subsidiaries. First half, 1944: net income, $7,787,133, equal, after preferred dividends, to $2.67 a common share, against $5,711,593, or $1.94 a share, in the same period of 1943.

Dividends Declared

Company	Stock	Rate	Payable	Stock of Record
Anaconda Wire & Cable Co.	Com.	$0.25	July 24	July 17
Collyer Insulated Wire Co.	Com.	0.50	July 1	June 24
Dayton Rubber Mfg. Co.	Com.	0.25 q.	July 25	July 10
Dayton Rubber Mfg. Co.	Pfd. "A"	0.50 q.	July 25	July 10
De Vilbiss Co.	Pfd.	0.175 q.	July 15	June 26
Dunlop Rubber, Ltd. (Amer. Dep. Rec.)	Com.	0.165 interim	July 8	May 26
Firestone Tire & Rubber Co.	Pfd.	1.125 q.	Sept. 1	Aug. 15
Hercules Powder Co.	Pfd.	1.50 q.	Aug. 15	Aug. 4
Lee Rubber & Tire Corp.	Com.	0.50 q.	Aug. 1	July 15
Tyer Rubber Co.	Pfd.	1.50 q.	Aug. 15	Aug. 10
United States Rubber Co.	8% Non-Cum. 1st Pfd.	2.00	Sept. 8	Aug. 25
United States Rubber Co.	Com.	0.50	Sept. 8	Aug. 25
U. S. Rubber Reclaiming Co., Inc.	Pfd.	0.50 accum.	July 12	July 5

CALENDAR

Sept. 10-15. A. C. S. Fall Meeting. Hotel Pennsylvania, New York, N. Y.

Oct. 3. Los Angeles Rubber Group, Inc. Mayfair Hotel, Los Angeles, Calif.

Oct. 3-5. National Safety Congress and Exposition. Chicago, Ill.

Oct. 5-7. SAE National Aeronautic Meeting and Engineering Display. Biltmore Hotel, Los Angeles, Calif.

Oct. 26. Northern California Rubber Group.

Rims Approved and Branded by The Tire & Rim Assn., Inc.

Rim Size	June, 1944
15" & 16" D.C. Passenger	
16x4.00E	80,027
16x4.25E	21,356
16x4.50E	9,340
16x5.00E	8,169
Flat Base Truck	
20x3.75P (5")	584
20x4.33R (6")	18,115
15x5.00S (7")	14,964
20x5.00S (7")	371,987
24x5.00S (7")	856
18x6.00T (8")	504
20x6.00T (8")	47,134
22x6.00T (8")	10,039
18x7.33V (9/10")	417
20x7.33V (9/10")	40,120
22x7.33V (9/10")	9,306
24x7.33V (9/10")	198
24x8.37V (11")	2,213
Semi D. C. Truck	
16x4.50E	5,710
16x5.50F	1,105
Tractor & Implement	
12x2.50C	1,437
15x3.00D	25,848
19x3.00D	21,050
36x4.50E	379
18 x5.50F	5,369
20x8.00T	2,406
24x8.00T	9,148
28x8.00T	1,301
32x8.00T	1,150
36x8.00T	1,029
W8-24	12,903
W8-32	3,919
W8-36	478
W8-38	692
W8-40	128
W9-28	1,868
W9-38	104
W10-26	868
W10-28	828
DW9-38	16,561
DW10-38	6,801
DW11-28	906
Cast	
24x15.00	82
TOTAL	757,399

LATIN AMERICA

BRAZIL

Studies on *Mangabeira* Latex

Details are published in the *Revista Brasileira de Quimica (ciencia e industria)* of February, 1944, of the Chemical Society of Brazil's third congress held in Rio de Janeiro from January 17 to January 25, when a number of papers on various scientific problems were read including a few on *Mangabeira* latex.

Ruben Descartes de G. Paula presented a "Study on *Mangabeira* Latex" in which particular attention was paid to two known defects of this latex—the high resin content and the marked tendency to darken shown by the rubber obtained. Various methods of coagulation were tested to improve the rubber, and a process was developed by which resin content was reduced from about 17% to 4%. Some of the latex constituents, especially the coloring material, inositol, were also investigated.

Practically the same problems were handled by two other authors, but from a different angle. Luis Ribeiro Guimaraes and Jose Maria Chaves in "Coagulation of *Mangabeira* Latex" discussed various methods of coagulation, including chemical means as well as a method of coagulation by agitating the latex, which latter process they recommended. These two authors also made studies "On the Protein and Pigments of *Mangabeira* Latex" which led them to the conclusion that the presence of a chromo protein or a Willstatter pigment is indicated. Tests made to deproteinize the rubber yielded no positive results.

Progress of Brazil's Rubber Manufacturing Industry

The development of the rubber manufacturing industry in Brazil in recent years has been such as to raise the country from an importer of rubber goods to the position of exporter of these goods, especially of tires and tubes. A Brazilian publication revealed that whereas in the decade 1931-40 the country's annual import of tires and tubes alone averaged more than 40,000,000[1] cruzeiros, and even reached the total of over 53,500,000 cruzeiros in 1939, there was a rapid decline in imports from 1940 on. In that year total imports of tires and tubes were valued at about 39,000,000 cruzeiros; in 1941, 27,000,000 cruzeiros; the progress of the war led to a still heavier drop in 1942, to 2,267,000 cruzeiros. During

[1] Valued at $0.0606 in American money in October, 1943.

SYNTHETIC . . .

Synthetics are the rule rather than the exception today. Foremen and workmen therefore need definite temperature schedules and dependable pyrometers in order to maintain these schedules. The CAMBRIDGE Roll Pyrometer is ideally suited to the Rubber Industry. It is an accurate, rugged, quick-acting instrument for determining the surface temperature of still or moving rolls.

Send for Bulletin No. 194.

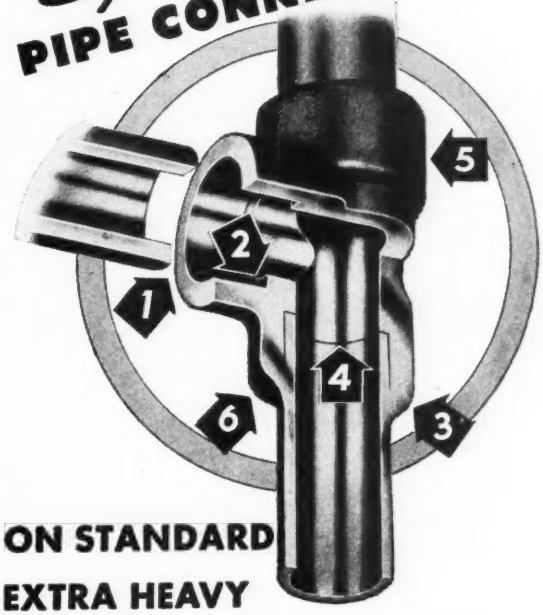
Roll Model

CAMBRIDGE INSTRUMENT CO., INC.
3732 GRAND CENTRAL TERMINAL, NEW YORK, N. Y.

BUY WAR BONDS
"a loan . . not a gift"

CAMBRIDGE
ROLL • NEEDLE • MOLD
PYROMETERS

Speed PIPE CONNECTIONS



ON STANDARD EXTRA HEAVY AND DOUBLE EXTRA HEAVY PIPE LINES

TIME-SAVING ADVANTAGES

1. *Easy To Install*—slip fitting over end of pipe and weld.

2. *Deep Socket*—supporting and aligning the pipe, eliminates task welding and the use of special fixtures. Accurate measuring and cutting of pipe unnecessary—Ample come—and—go.

MAINTENANCE-SAVING ADVANTAGES

3. *Position of Weld*—prevents welding icicles inside pipe—no clogged lines. Wall sections 1¼ times the nominal pipe thickness permits proper heat penetration and correctly proportioned fillet weld.

4. *Smooth Flow*—assured as inside diameter of fitting matches inside diameter of pipe.

5. *Long Bands*—extending well beyond bottom of socket, provide ample reinforcement, eliminating weak sections.

6. *Strong, Trouble-free Joints*—the fitting and pipe are fused into one integral unit permanently tight and leak-proof. Unaffected by vibration, distortion and shock.

W-S Forged Steel Socket Welding Fittings are machined from solid drop forgings. Available for use with Standard Pipe—Schedule 40 Extra Heavy Pipe — Schedule 80 and Schedule 160 Pipe, and Double Extra Heavy Pipe. Sizes ¼" to 4" I.P.S. Each class can be furnished in Carbon Steel; Carbon-Molybdenum Steel; Chromium-Molybdenum, Steel or Stainless Steel. Conform to ASA Standards. Ask for Bulletin A-3.

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"G" RESIN
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Although none of our resins are under W.P.B. allocation, because of important large war uses for the above resins prompt deliveries are now only being effected on AA priority ratings.

The following resins, which are dark-colored, are currently available in large quantities for prompt shipment without priorities:

NUBA* PARADENE* 465 RESIN

NEUTRAL
WATERPROOF
CHEMICALLY
RESISTANT

*REG. U.S. PAT. OFF.

Perhaps one of these would be just what you want. Write or wire for information and samples.

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Chemicals for the Nation's War Program

BENZOL • TOLUOL • XYLOL • TOLUOL SUBSTITUTES • CRUDE COAL-TAR SOLVENTS
HI-FLASH SOLVENTS • COUMARONE-INDENE RESINS • TERPENE RESINS • TAR PAINTS
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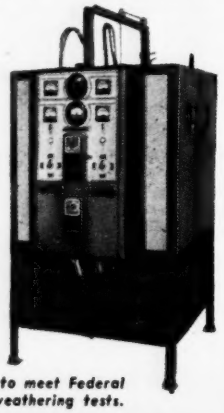
RECLAIMING, PLASTICIZING, NEUTRAL, CREOSOTE, AND SHINGLE STAIN OILS

WEATHERING TEST
for rubber products

Weathering effects of sunlight, rain, heavy dew and thermal shock reproduced in the laboratory at an accelerated rate that reduces years of actual weathering to a few days of testing in the —

ATLAS TWIN-ARC WEATHER-OMETER

The Twin-Arc Weather-Ometer has full automatic control of light and water periods. The Atlas Cycle Timer unit can be set to reproduce any combination of weathering conditions. A direct reading thermal regulator, automatic shut-off switch and a running time meter is included on the control panel. After setting exposure cycle on the control panel the Weather-Ometer is safe to be left in continuous operation over night without attention except to replace carbons once in 24 hours.



The Atlas Weather-Ometer is required to meet Federal Specifications demanding accelerated weathering tests.

ATLAS ELECTRIC DEVICES COMPANY
361 W. Superior Street, Chicago 10, Illinois
Originators and sole manufacturers for over a quarter of a century. . . Weather-Ometers, Launder-Ometers, Fade-Ometers are the accepted standard accelerated testing machines all over the world.

the first nine months of 1943 the value of imported tires and tubes was 2,033,000 cruzeiros, which would indicate an increase again; however, this was partly due to higher prices for the goods and partly to greater demand for tires and tubes for airplanes, a line of manufacture that was only just being considered in Brazil.

While imports declined, exports of tires and tubes gained rapidly. In 1940 the value of exports of these goods was only 149,000 cruzeiros; 1941, 826,000 cruzeiros; in 1942, 54,466,000 cruzeiros; and in the first nine months of 1943, the record total of 139,599,000 cruzeiros. Thus in nine months of 1943, Brazil received a sum of exports of tires and tubes that exceeded the average amount paid for imports of these same goods in 3½ years of the pre-war period.

The following table shows exports during the first nine months of 1943. Many of the goods had never before appeared in the country's export statistics.

	Cruzeiros
Tires	128,894,000
Inner tubes	10,705,000
Rubber thread	5,409,000
Shoes and galoshes	4,303,000
Rubber and cotton fabrics	1,890,000
Machinery belting	1,727,000
Combs and the like	1,628,000
Rubber and fabric	1,103,000
Rubber combined with rayon	877,000
Rubber sheets	191,000
Special rubber articles	154,000
Unspecified goods of rubber	7,909,000
Total	164,790,000

Though tires and tubes are the most important rubber products of Brazil, only a few of the many rubber factories in the country are devoted to their manufacture; the rest make almost every other kind of rubber goods. The 123 firms registered with the Section of Industrial Planning as manufacturers of rubber or as factories utilizing rubber in some form or other employ more than 12,000 workers, about 4,500 of whom work for the five largest factories. Most of the factories, 79 in all including some of the largest, are in Sao Paulo, 22 are in the Rio de Janeiro district, 14 in Rio Grande do Sul, two in the State of Rio, two in Para, two in Santa Caterina, one in Pernambuco and one in Amazonas. But only four factories produce tires for automobiles, two make motorcycle tires and three bicycle tires. Rubber tubing is made in 24 factories; rubberized fabrics in 24; rubber cements in 12; shoes with rubber soles, in 10; latex goods in seven; insulations for electrical conductors, in six; transmission belting in nine; storage battery boxes in four; plasters in four; and ebonite and rubber goods in general, in 59.

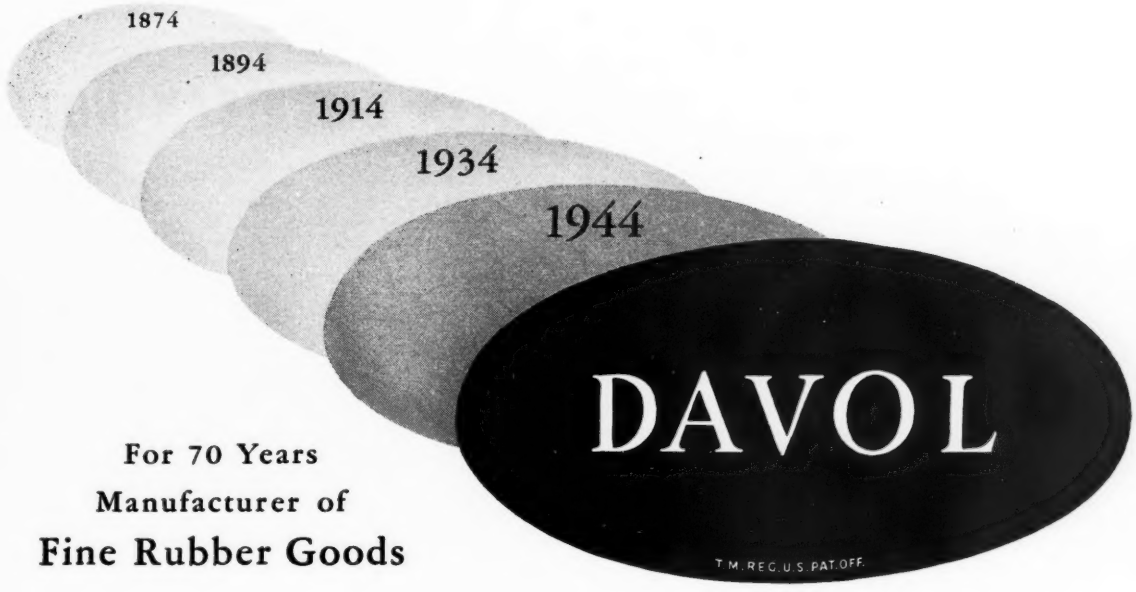
By agreement with Washington, D. C., Brazil has undertaken to limit home consumption of crude rubber to 10,000 tons a year and to insure that this amount is not exceeded. The use of crude rubber is controlled by the Section of Industrial Products. However the use of reclaim is to be increased, and production, at present still rather limited, is to be raised to about 300 tons a month. The use of *Manicoba* and *Mangabeira* rubber also seems to be increasing for certain articles.

To prevent precious rubber from being used for manufactures considered non-essential the production of a long list of articles has been reduced to 50%, where it has not been prohibited altogether. In addition there is a list of 32 articles whose manufacture is only permitted if the rubber used is *Manicoba*, *Mangabeira*, or reclaim rubber, or a combination of these. Finally there are eight articles whose manufacture is only permitted when expressly authorized by the Section of Industrial Production, and these include, among others, fine elastics, golf and tennis balls, sponge rubber goods.

COLOMBIA

Industria Colombiana de Llantos has been formed with a capital of 3,000,000 pesos (about $1,500,000) to manufacture tires at Bogota. A tire factory is under construction, and machinery has been installed. Operations are expected to be well under way by the end of the current year or early in 1945, when daily output, it is hoped, will reach 200 tires. Colombia rubber is to be used.

Colombia produces wild rubber from *Castilloa* trees as well as from *Hevea*. However it is learned that the government in cooperation with the United States Rubber Development Corp. is starting three rubber plantations of more than 1,200 acres each, in the Leon River Valley, in the municipalities of Acandi, Turbo, and Chigorodo, in the State of Uraba. Land is being cleared at present, and it is expected to begin planting budded seedlings from the nursery this year. The nurseries are said to have more than 700,000 seedlings, and it is planned to bud each one twice, the first time to insure a high-yielding trunk, and the second to provide the plant with a crown



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Red Lead (95% · 97% · 98%)	Sublimed Blue Lead
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Litharge	Basic White Lead Silicate
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from strains resistant to leaf disease. When the trees are mature, they are expected to yield at the rate of a ton of rubber for every 2½ acres, that is about 800 pounds per acre.

LATIN AMERICAN NOTES

The Central American States are contributing increasing amounts of crude rubber to the war effort. Guatemala is said to have shipped out over 150,000 pounds of rubber to the United States; Honduras sent 45,000 pounds to the United States in March, bringing the total shipments to almost 500,000 pounds.

Nicaragua's exports of rubber have during the last few years increased to such an extent that in 1941, only 60 tons of rubber were exported, but in 1942 576 tons were exported and in 1943 1,267 tons. All indications are that shipments will be further increased in 1944.

According to press reports plans are afoot to start a new rubber goods factory in Bolivia. As sanction of the Ministry of Economy is required, a request for permission to establish this enterprise has been submitted.

Some years ago a factory of Czechoslovakian origin—presumably Bata—was established in Peru to manufacture footwear. In 1942 the factory is said to have produced 128,000 pairs of rubber-soled shoes. Data of more recent outputs by this firm have so far not become available.

A sterilized, water-softened meal prepared from corn is employed in an Argentina factory as the basic material for producing butanol, used in the manufacture of synthetic rubber. The process followed, which involves fermentation, yields in addition to butanol, acetone and ethyl alcohol as well as hydrogen gas, as a by-product.

Venezuela is suffering from a serious shortage of tires especially for trucks, and as a result there has been a considerable decrease in the numbers of trucks on the road, with disruption of distribution services as the immediate consequence. The transportation of food in particular has become a serious problem, and profiteers are apparently trying to take full advantage of the situation, for there are reports of much price speculation in food. The arrival recently of a shipment of between 1,000 and 2,000 used tires brought from Curacoa will ease conditions somewhat, but is not expected to afford much relief as regards the shortage of truck tires.

EUROPE

SOVIET RUSSIA

The recent announcement that E. I. du Pont de Nemours & Co., Inc., is permitting Russia to manufacture neoprene calls attention to the fact that the Russians had developed a chloroprene rubber in 1933 which they called Sovprene. Details then published in a Russian trade paper revealed that the basic materials used for producing Sovprene are coal, lime, and hydrogen chloride, and the following steps were mentioned: (1) obtaining calcium carbide from coal and lime; (2) obtaining acetylene from calcium carbide; (3) obtaining monovinyl acetylene from acetylene via catalytic reaction; (4) separating and purifying the monovinylacetylene from divinyl acetylene and other by-products; (5) obtaining chloroprene by combining hydrogen chloride with monovinylacetylene; (6) rectifying chloroprene and distilling off the by-products of chlorination; (7) Polymerization of chloroprene with the addition of necessary ingredients to synthetic rubber called Sovprene.

The reaction is expressed by the equation:

$$CH{\equiv}C{-}CH{=}CH_2 + HCl \rightarrow CH_2{=}\underset{\displaystyle Cl}{\overset{|}{C}}{-}CH{=}CH_2$$

The unpolymerized and purified chloroprene was described as a colorless fluid with characteristic odor, slightly soluble in water, but easily mixed with most organic solvents.

The constitution of chloroprene (C_4H_5Cl) as obtained by the Russian method, was C, 54.25%, H, 5.69%, Cl, 40.06%, which com-

Is BUNA "S" slowing your production and increasing your costs because:—

1. It produces excessive shrinkage?
2. It resists compound dispersion?
3. It lacks tack?
4. It overloads equipment?

If so, you are working under a handicap!

Meet these enemies with:—

"SUPER-TAC"

Plasticizer Tackifier

SYNTHETIC RUBBER
WILL EQUAL
NATURAL RUBBER
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Through the use of

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Plasticizer

Its success lies in reducing the heat created by friction and "staying with" the compound instead of volatilizing during the mix which robs the stock of tack and causes it to "set" in the succeeding warming operation.

GALEY MANUFACTURING COMPANY

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Improved Type
HYDRAULIC VALVE

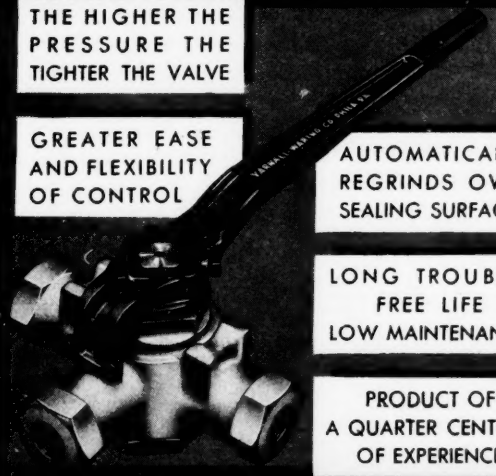
THE HIGHER THE PRESSURE THE TIGHTER THE VALVE

GREATER EASE AND FLEXIBILITY OF CONTROL

AUTOMATICALLY REGRINDS OWN SEALING SURFACES

LONG TROUBLE-FREE LIFE LOW MAINTENANCE

PRODUCT OF A QUARTER CENTURY OF EXPERIENCE



Yarway Single Pressure Hydraulic Valves are made in straight-way, three-way and four way types, in five sizes for pressures up to 5000 lb. Also Yarway Two-Pressure Valves in two sizes for pressures up to 4000 lb. Write for Bulletin H-209.

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SCHUSTER CALENDER GAUGE

. . . IT CAN NOW BE EQUIPPED WITH AUTOMATIC CONTROL

NEW—and more valuable than ever. For the past 13 years The Schuster Calender Gauge has proven itself an outstanding and indispensable instrument in the rubber industry. *Now* it automatically adjusts your rolls to a predetermined thickness and correctly maintains that thickness. Coatings for tire fabric and similar uses are kept accurate and uniform *automatically.* The result is a better product at a lower cost. Write us today for complete particulars.

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Single or Multiple Cavity
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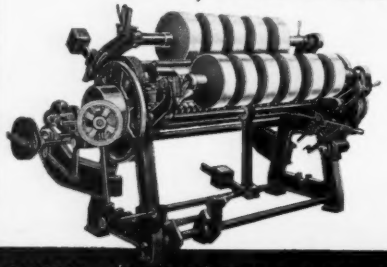
CAMACHINE 24-7
FOR SLITTING

Rolls of the above materials, also rolls of similar materials are accurately slit on CAMACHINE 24-7 and rewound into rolls of uniform density. Write for descriptive folder.



CAMERON MACHINE COMPANY 61 POPLAR ST., BROOKLYN 2, N. Y.
MIDWEST OFFICE: Harris Trust Building, 111 West Monroe Street, Chicago 3

pared with American figures published in 1932: C, 54.37%; H, 5.95%, Cl, 39.51%.

Like the American chloroprene rubber, Sovprene was said to be the α-polymer of chloroprene with the addition of various ingredients during polymerization.

The literature at the time described Sovprene as being similar to natural rubber in appearance, but possessing a characteristic odor which depended to a considerable extent on the percentage of volatile products remaining after polymerization. The odor, at least of some of the earlier samples of Sovprene, was said to be so objectionable as to make processing on ordinary rubber equipment extremely difficult. In any case the odor was far more pronounced than that of American chloroprene rubber.

These early data further showed that Sovprene had (1) high mechanical qualities, high relative elongation, good tensile strength with low permanent elongation, and very satisfactory abrasion resistance; (2) resistance to organic solvents and vegetable and mineral oils; (3) good imperviousness to air and gas; (4) resistance to heat and many chemicals. Against these advantages, however, were various objections: the odor already mentioned; the ease with which by-products formed during the process of producing Sovprene whereby the quality of the main material was lowered; the tendency of Sovprene to continue to polymerize, and the tendency of both vulcanized and unvulcanized Sovprene to harden during storage; low adhesive capacity; difficulty of dissolution in any but the strongest organic solvents, the use of which endangered the health of the workers.

GREAT BRITAIN

The twenty-second annual meeting of the Institution of the Rubber Industry took place May 24 when Sir Walrond Sinclair was re elected president for the year 1944-45. The following vice presidents were also elected: F. D. Ascoli, Sir George Beharrell, R. G. H. Buxton, Col. J. Sealy Clarke, Hugh C. Coles, Lord Colwyn, H. A. Daynes, H. B. Egmont Hake, Alexander Johnston, Fordyce Jones, L. V. Kenward, Sir Eric Macfadyen, H. Eric Miller, H. G. Montgomery, S. S. Pickles, Herbert Rogers, S. T. Rowe, P. Schidrowitz, W. J. Terry, D. F. Twiss, and D. F. L. Zorn. H. W. Franklin was reelected honorable treasurer.

The members of the newly elected council include: W. C. Barry, of W. T. Henley's Telegraph Works Co., Ltd.; C. H. Birkitt, Rubber Control Ministry of Supply; C. M. Blow, John Bull Rubber Co., Ltd.; O. W. H. Briggs, Harborough Rubber Co., Ltd.; S. Buchan, T. B. Andre Rubber Co., Ltd.; P. J. Burgess, London Advisory Committee for Rubber Research, Ceylon and Malaya; J. H. Carrington, Anchor Chemical Co., Ltd.; E. J. Coles and C. R. Pinnell, William Warne & Co., Ltd.; F. H. Cotton, Northern Polytechnic; T. R. Dawson, Rubber Research Association of British Rubber Manufacturers; J. R. MacF. Duncan, Craigpark Electric Cable Co., Ltd.; C. Falconer Flint and Maldwyn Jones, Imperial Chemical Industries, Ltd.; G. Gee and J. Wilson, British Rubber Producers' Research Association; W. A. Hazlett and L. R. Mernagh, Goodyear Tire & Rubber Co.; M. M. Heywood, Firestone Tire & Rubber Co., Ltd.; R. W. Lunn, Leyland & Birmingham Rubber Co., Ltd.; J. F. Morley, P. B. Cow & Co., Ltd.; E. A. Murphy, F. Thomas, and D. Parkinson, Dunlop Rubber Co., Ltd.; W. Bowden, F. M. Panzetta, and H. Skelton, British Tire & Rubber Co., Ltd.; L. R. Ridgway, Premier Waterproof & Rubber Co., Ltd.; W. R. Row, India Rubber, Gutta Percha & Telegraph Works Co., Ltd.; A. Ryan, Ioco, Ltd.

The annual general meeting was followed by an extraordinary general meeting to pass alterations to the articles of Association. Later a paper by R. J. Tudor, "Synthetic Rubber Processing", which had won first prize in the 1943 competition for the President's Prize, was read by M. M. Heywood.

This year the Colwyn Gold Medal was awarded by the I.R.I. to A. Healey for conspicuous services in connection with the technique of tire manufacture with special reference to the problems arising from the use of synthetic rubber. Mr. Healey, a director of the Dunlop Rubber Co., Ltd., is at present adviser on synthetic rubber usage to the Ministry of Supply at Rubber Control.

A new system of recapping which uses segmented tread sections and the so-called Uniflex single-unit vulcanizer, but no molds, is especially designed for small shops or users. It is claimed that by this method tires of any size for cars or trucks can be recapped while on the road wheel and that the work can be done by unskilled labor with no fear of air pockets, faulty joints, etc. The new system, called the "Uniflex" method was recently introduced by Union Rubber Works, Ltd., Leeds, which also makes "Traxted" recapped tractor, dumper, and earth-removal tires.

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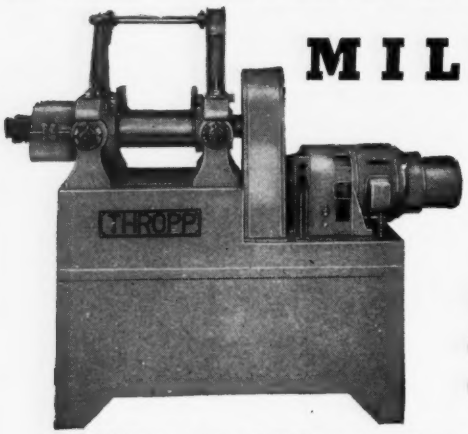

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Editor's Book Table

BOOK REVIEWS

"The Rubber Workers. Labor Organization and Collective Bargaining in the Rubber Industry." Harold S. Roberts. Published by Harper & Brothers, 49 E. 33rd St., New York, N. Y. 1944. Cloth, 8½ by 5½ inches, 452 pages. Index. Price $4.

This account of labor organization and collective bargaining against the historic and economic background of the chief center of the rubber industry is, in effect, the story of the efforts to organize one of the "citadels of anti-unionism." It is predicated on the assumption of the author, a senior economist for the National War Labor Board, that "collective bargaining is an essential democratic procedure and should be extended to permit employes to participate actively in the problems of the industry." He believes that workers have as much at stake in plant operation as do employers, that unionization should parallel the structure of the industry, and that the sphere of bargaining by strong, responsible unions must be the competitive area. Maintaining that the outlook for collective bargaining, and the industry under it, is bright, Mr. Hunter states that "collective bargaining on an industry-wide basis appears remote." The future of industrial relations in rubber manufacture to no small degree rests upon postwar American economy and changes resulting in the industry if it becomes entirely dependent on synthetic rubber controlled by the major companies.

Mr. Hunter traces early organizational efforts and attempts at collective bargaining. He chronicles the 1913 strike, the following 20 years of comparative peace and plenty, and the industry under the National Recovery Act. A chapter is devoted to the protracted contract negotiations between the Goodyear Tire & Rubber Co. and the United Rubber Workers of America which realized that "stable labor relations and mature collective bargaining in the industry would be impossible unless the Goodyear company could be brought within the fold." The role played by the National Labor Relations Board in settling collective bargaining disputes of the industry is reviewed, and the current problems of organization, decentralization and wage differentials are discussed. A final chapter records eight years of accomplishments of the United Rubber Workers' objectives (a membership of 150,000 out of 180,000 employed in the industry in June, 1943, is claimed) and surveys probable developments of collective bargaining in the industry.

Copious footnotes and statistical tables document the text, and there is an extensive bibliography of books, magazine and newspaper articles, and government publications.

"Synthetic Resins and Rubbers." Paul O. Powers. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. 1943. Cloth, 8½ by 5½ inches, 296 pages. Indexed. Price $3.

This book briefly describes the chemistry and application of the commercially important polymers and a few others. Much of the material was used in the engineering science and managing defense and war courses at Franklin & Marshall College. A discussion of the theories of polymer formation serves as an introduction to more detailed analyses of condensation polymers, vinyl polymers, and synthetic rubbers. Chlorinated rubber, rubber hydrochloride, and "cyclicized" rubber are treated in a section on resins from natural products. A short chapter on the more generally used solvents and plasticizers lists their properties and rules for their use. Molding operations and materials for plastics and the use of synthetic resins in protective coatings are briefly summarized.

The chapter on synthetic rubbers, written by K. H. Weber, of Armstrong Cork Co., devotes about 50 pages to the structure, properties, production methods, and uses of the resilient synthetics, polychloroprene, polybutadiene, polysulphide, and polybutene. Although no new material is presented beyond that which has appeared in periodical literature, and the information included is less than exhaustive, Dr. Weber's contribution is a carefully organized and written historical survey of the technical and manufacturing aspects of synthetic rubbers.

A table of raw materials for synthetic resins gives the formulae, physical properties, sources, and uses of 40 chemicals. Other numerous tables, charts, and photographs illustrate the text. Short reference lists are given at the end of each chapter.

"Handbook of Chemistry." Fifth Edition. Compiled and edited by Norbert A. Lange. Assisted by Gordon M. Forker. With an Appendix of Mathematical Tables and Formulas by Richard S. Burington. Published by Handbook Publishers, Inc., Sandusky, O. 1944. Fabrikoid, 8 by 5½ inches, 2092 pages. Index. Price $6.

The latest edition, revised and enlarged, of this useful reference volume of chemical and physical data retains the familiar characteristics of earlier editions. All the subject matter has been retained except the table of suffixes (used in the nomenclature of organic compounds), which together with prefixes and symbols, is now found in a glossary of organic chemistry nomenclature. Six new tables, including one on plastics, have been inserted. Thirteen tables have been extended or completely rewritten, necessitating the addition of 174 pages.

The table of physical constants of organic compounds has been increased to 6,507 compounds, with a corresponding list of more than 3,500 synonyms. Many changes have been made throughout the book to insure accurate and up-to-date information. No changes were made in the synthetic rubber tables.

"Infrared Spectroscopy, Industrial Applications and Bibliography." R. Bowling Barnes, Robert C. Gore, Urner Liddel, and Van Zandt Williams. Published by the Reinhold Publishing Corp., 330 W. 42nd St., New York 17, N. Y. 1944. Fabrikoid, 9¼ by 6 inches, 236 pages. Price $2.25.

Infrared spectroscopy is finding acceptance in industry because it has solved many problems in organic chemistry. This book, which is important since nearly all organic substances possess selective absorption at certain frequencies in the infrared portion of the electromagnetic spectrum, discusses the theory and its relation to molecular structure. The detailed descriptions of analytic techniques are clues to the progress that has been made in spectrometers and spectroscopy.

More than 350 spectrographs of organic compounds taken in the rock salt region of the infrared spectrum include aliphatic and aromatic hydrocarbons, alcohols, ethers, carbonyl compounds, nitrogen compounds, terpenes, and organic chlorides. Applications to the synthetic and substitute rubber industries are readily apparent in spectra of butadiene, acrylonitrile, styrene, isoprene, polyvinyl alcohol, ethyl cellulose, and others.

The descriptive material and spectrographs have appeared in the Analytical Edition of *Industrial and Engineering Chemistry*[1]. A bibliography of more than 2,700 items has not been previously published.

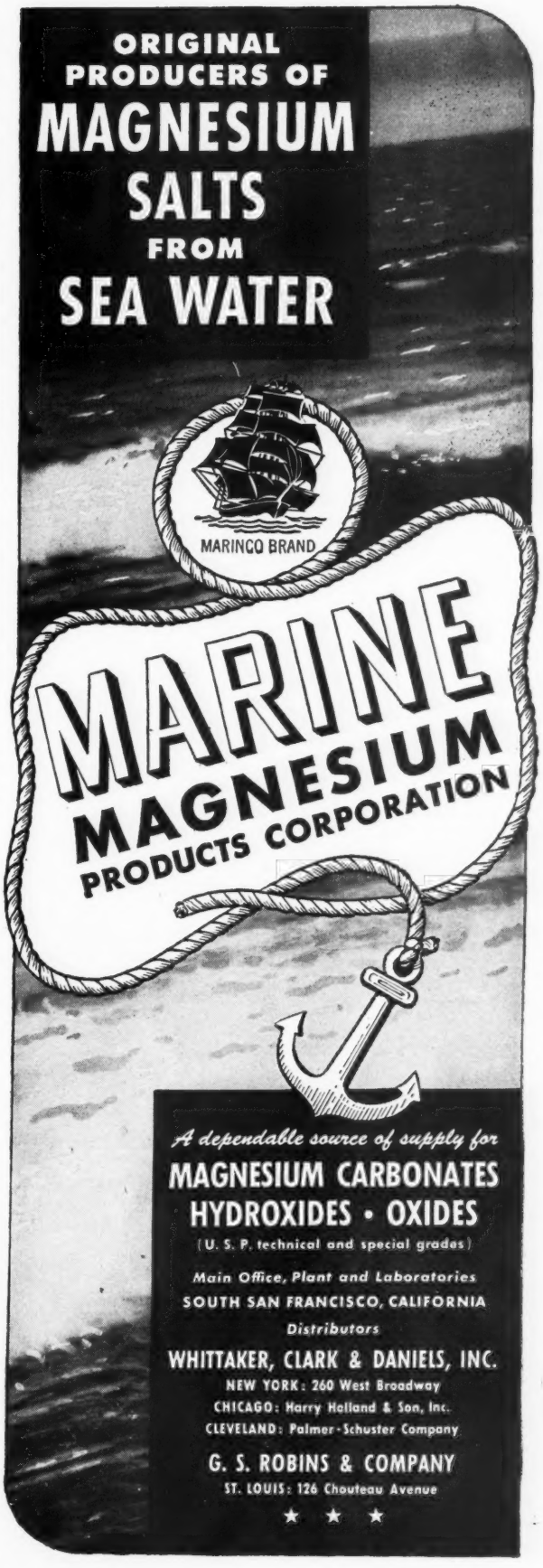
[1] 15, 11 (Nov., 1943).

NEW PUBLICATIONS

"Climco Processed Liners—Linerette Paper." The Cleveland Liner & Mfg. Co., Cleveland, O. 8 pages. Popularly called "blue" liners because of their distinctive color, Climco non-sticking liners have been extensively employed in the rubber industry for coated and frictional stocks, many grades of gum stocks, and as book leaves for all stocks, and separators for all batch stocks. This illustrated booklet describes the advantages of Climco Processed Liners in reducing manufacturing costs and protecting stocks. Several helpful suggestions illustrated with diagrams are given for the use of these liners with regard to splicing, wrinkles, the insertion of liners, and method of separation. These liners have been used successfully with synthetic and substitute stocks, and the Linerette interleaving paper is sometimes employed in place of Holland cloth for lightweight stocks.

"Standard Oil Co. Annual Report for the Year Ended December 31, 1943." Standard Oil Co., Inc., of New Jersey, 30 Rockefeller Plaza, New York, N. Y. 32 pages. Financial statements of the company and achievements in production of 100 octane gasoline, synthetic toluene, butadiene, and butyl rubber are included in this report to shareholders.

"Heresite, Plastic Coatings, Synthetic Resins, Synthetic Rubber." Dominion Rubber Co., Ltd., 550 Papineau Ave., Montreal, P. Q., Canada. 1944. 32 pages. This illustrated booklet describes the industrial coatings and other products of the Heresite & Chemical Co., Manitowoc, Wis., which are distributed in Canada by Dominion Rubber. Of particular interest is the announcement of Herebuna "S" and Herebuna "N" recently developed Heresite synthetic polymers. Herebuna "S", a tire rubber, is said to have high resistance to heat and abrasion and in tensile strength to approach that of natural rubber. Herebuna "N", a special-type rubber for oil and gasoline hose, tank linings, gaskets, and packings, is admittedly more difficult to handle than natural rubber. It can be cured to hard rubber by vulcanization with sulphur and rubber accelerators. A yield of 97% on a single pass making the recovery of unreacted raw materials unnecessary is claimed for Herebuna synthetic rubbers.



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"Comparison of Ultra-Accelerators in GR-S." R. T. Vanderbilt Co., 230 Park Ave., New York, N. Y. June, 1944. 28 pages. Using a standard GR-S base compound with MPC black, zinc oxide and Reogen, nine ultra-accelerators, methyl and ethyl tuads, methyl and ethyl zimate, methyl and ethyl ledate, methyl and ethyl Selenac, and Cumate, are compared as primary accelerators, secondary accelerators, and as vulcanizing agents in the absence of sulphur. Test data were obtained on curing rates, compression set, heat build-up, processing safety, and oven aging resistance. The recorded results emphasize the usefulness of Cumate as a primary and secondary accelerator to give fast cures, of methyl and ethyl ledates as secondaries for fast cures, and of tuads and Selenac as vulcanizing agents in sulphurless compounds.

"'Thiokol' FA Compounds for Hose Tube and Cover Stocks." Technical Service Bulletin No. 23. Thiokol Corp., Trenton, N. J. 3 pages. Formulations for hose made with an extruded tube and cover, and hose tube and cover stock made from calendered stock are given in which "Thiokol" FA and Buna N are blended in about 80/20 proportions. BTDS in the FA stock is said to be sufficient to accelerate the Buna N phase; therefore no accelerator is recommended for the Buna N stock. The adhesion of friction assemblies between one of the above stocks and a high acceleration GR-S friction stock containing Galex was 16 pounds under test and friction to friction 23 pounds.

"The Statistical Length of Rubber Molecules." L. R. G. Treloar. Publication No. 45 of The British Rubber Producers' Research Association, 19 Fenchurch St., London, E.C.3, England. 12 pages. Previous methods used by Mr. Treloar for the determination of the statistical lengths of paraffin chains have been used by him for the same determinations with respect to the rubber molecule. Results are reported in this paper, which gives the distribution functions of lengths up to 98% of the fully extended length for chains corresponding to molecular weights up to 17,400. The distributive functions derived in this investigation may not be necessarily quantitatively accurate in their applicability to rubber. However they represent the kind of deviations from the simple formula which must occur in polyisoprene.

"Synthetic Times." Published monthly by and for the employes of the United States Rubber Co., Synthetic Rubber Division, Institute, W. Va. Vol. 2, No. 4. May, 1944. 12 pages. Items of general interest and employe and plant news make up the editorial content of this photographically illustrated paper.

"A Summary of Data on Synthetic Rubber." The Rubber Manufacturers Association, Inc., 444 Madison Ave., New York 22, N. Y. July, 1944. 36 pages. This digest of information discusses the processes of manufacture and the chemical composition of the five most important synthetic rubbers, other synthetics, and rubber-like materials. Introductory notes give the historical development and statistics and other data on the government program. The booklet was issued primarily as an aid to editors and writers in need of a summary of current facts on this subject.

"Cotton Yearbook of the New York Cotton Exchange, 1943." New York Cotton Exchange, 60 Beaver St., New York, N. Y. 1944. 120 pages. The sixteenth "Cotton Year Book" includes available statistics for the 1942-43 season on production, movement, consumption, stocks, distribution, and prices of cotton added to the series of statistics found in the previous volumes.

"R. B. H. Dispersions Technical Section." R. B. H. Dispersions, Inc., Bound Brook, N. J. May, 1944. 22 pages. This monthly bulletin contains a reprint from *Interchemical Review* of Ruth N. Weltmann's illustrated article, "Industrial Viscometers." The article discusses various industrial visometers used in obtaining rheological specifications of liquids and plastics and thixtropic materials.

"Bricks without Straw." The B. F. Goodrich Co., Akron, O. 1944. 45 pages. This booklet tells of the development of Ameripol tires and of the cooperative production of the Goodrich company in the government's synthetic rubber program.

"What Is the Truth about the Cotton Textile Situation?" The Cotton-Textile Institute, Inc., 320 Broadway, New York, N. Y. 16 pages. **"Guide to Postwar Financial Planning for Manufacturers."** National Association of Manufacturers, 14 W. 49th St., New York 20, N. Y. 20 pages. **"Program and Progress Report."** Smaller War Plants Corp., Washington, D. C. 66 pages. **"Today's Truck Tire Outlook."** J. E. Powers, Pennsylvania Motor Truck Association, Inc., Harrisburg, Pa. 16 pages. **"Postwar Employment and the Liquidation of War Production."** Research Committee of the Committee for Economic Development, 285 Madison Ave., New York 17, N. Y. 26 pages.

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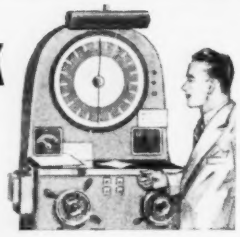

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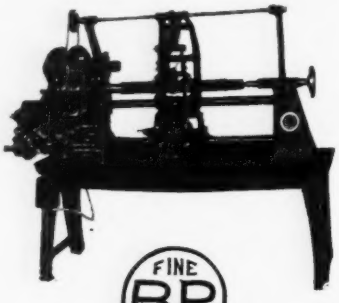
THE 4-A WASHER CUTTING MACHINE

is indispensable for manufacturers of general line of washers and gaskets of rubber, synthetics, and compounded materials. Profitable operation on short or long runs. Will accommodate up to 10" O.D. and cuts up to ¾" in width. Model shown has driven knife. Write for further details of operation.

Note Increase in Outside Diameter.



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BLACK ROCK MFG. CO.

175 Osborne Street Bridgeport 5, Conn.

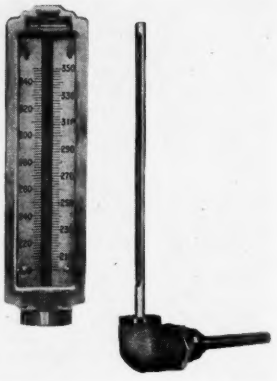
Eastern Representatives for the Schuster Magnetic Gauge

New York Office: 305 Broadway

Pacific Coast Representatives: Lombard Smith Co. 2032 Santa Fe Ave., Los Angeles, Cal.

New Machines and Appliances

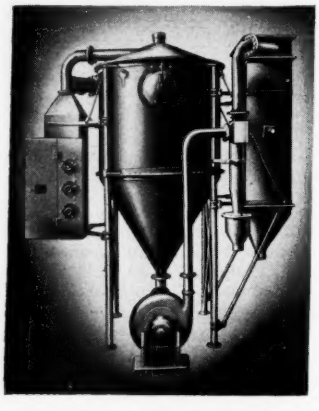
New-Type Industrial Thermometer



A NEW development in the industrial-type mercury and glass thermometer is the refill type. As may be seen from the illustration, in purchasing these thermometers it is also possible to purchase a supply of refills so that in case of breakage, a repair can be made right away, and the thermometer put back in service. This feature also affords to the user an opportunity to change the range of the thermometer by simply changing the type of refill in the thermometer case. Another outstanding feature of this thermometer is that there is no mercury base around the glass bulb in the chamber. The glass bulb is embedded in a metallic material which makes the glass bulb and the metal a solid part of the bulb chamber itself. This construction increases sensitivity and prevents slippage of tubes in the case. The glass tube in this thermometer is carried in an armor from the bottom of the bulb chamber to the top of the case, and the armor is anchored in the top of the case, making a very rigid construction which reduces breakage. The case is also moisture- and dust-proof since the front cover is molded down on a gasket that prevents fogging of the glass.

These H-S thermometers may be obtained in the various types of angles and length of stems as required for different industrial applications. Seely Instrument Co., Inc.

Spray Drier for High-Value Products



Type N Turbulaire Spray Drier

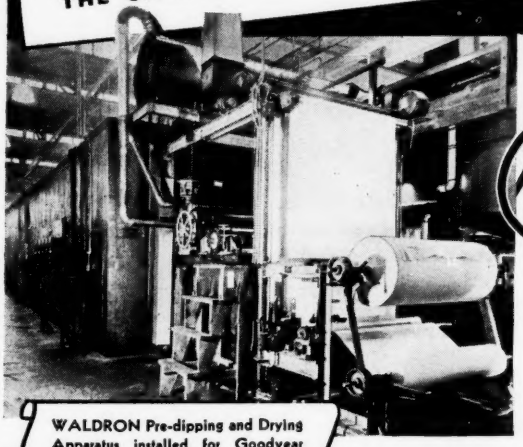
TYPE N TURBULAIRE spray drier, an inexpensive small-capacity spray drier for the commercial drying of fine chemicals, for use in laboratory research in certain rubber processing applications and in pilot-plant operation on specific materials, is rated at an evaporation of 25 pounds of water an hour at an inlet-to-outlet temperature differential of 300° F. Varying conditions, however, such as type of material handled and the concentration of solids in the feed, will cause the actual evaporation rate to vary well above or below the rated capacity. Maximum operating flexibility is gained by optional use of either direct or indirect heaters. The desiccating chamber is provided with a secondary inlet for introducing tempering air at inlet temperature, or precooled to any desired temperature, which permits investigation of the dryability of thermoplastic and heat-sensitive materials as well as those having a tendency to case-harden.

The spray drier is furnished in black iron, stainless steel, or other alloys. Standard equipment includes an electric heater, four-foot desiccator with cone bottom and hand-operated mechanism for sweeping surface accumulations from the conical section, Multiclone collector, fan, bag house and control instruments mounted on a single frame. Only electrical, compressed air, and feed line connections need be made. The complete assembly occupies a floor space of about five feet by ten feet with a headroom of ten feet, six inches. Western Precipitation Corp.

GOODYEAR
THE GREATEST NAME IN RUBBER

operates the most modern equipment for

pre-dipping and drying cord fabrics



WALDRON Pre-dipping and Drying Apparatus installed for Goodyear Tire & Rubber Company.

Either rayon or cotton cord fabrics—processed at speeds up to 50 yards per minute with this modern WALDRON machine. Pre-dipping in water dispersed latex or similar substance and uniform drying with recirculated high temperature air under automatic control is achieved in a continuous operation. With WALDRON machines—strength, uniform quality and speedier processing are combined.

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Refined Rubbermakers' Sulphur, Tube Brand, 100% Pure
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Caustic Soda, Sulphur Chloride

Stauffer CHEMICALS SINCE 1885

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Adamson mixing and molding equipment is built to meet modern production demands for greater accuracy at lower costs. What's your machine problem? A card will bring full particulars. Write today!

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63 YEARS WITHOUT REORGANIZATION

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for every purpose
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FOR TECHNICAL AND DRUG USES

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Red Iron Oxides
Green Chromium Oxides
Green Chromium Hydroxides

Reinforcing Fillers and Inerts

C. K. WILLIAMS & CO.

EASTON, PA.

The GENERAL TIRE

—goes a long way to make friends

Factory Control KRAFT SYSTEM TIRE RENEWING

Look for this emblem on tires recapped by the Kraft System

KRAFT SYSTEM KRAFTRED TIRE RENEWING

TRADE MARK REG. U. S. PAT. OFF.

THE GENERAL TIRE & RUBBER COMPANY • AKRON, OHIO

VULCANIZED VEGETABLE OILS

—RUBBER SUBSTITUTES—

Types, grades and blends for every purpose, wherever Vulcanized Vegetable Oils can be used in production of Rubber Goods—be they Synthetic, Natural, or Reclaimed.

A LONG ESTABLISHED AND PROVEN PRODUCT

THE CARTER BELL MFG. CO.
SINCE
CARTER BELL PRODUCTS
1903
SPRINGFIELD, NEW JERSEY

Regular and Special Constructions
of

COTTON FABRICS

Single Filling **Double Filling**
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ARMY
Ducks

HOSE and BELTING
Ducks

Drills

Selected
Osnaburgs

Curran & Barry
320 BROADWAY
NEW YORK

Market Reviews

COTTON & FABRICS

NEW YORK COTTON EXCHANGE WEEK-END CLOSING PRICES

Futures	May 27	June 24	July 1	July 8	July 15	July 22
Sept.	....	....	21.57	21.89	21.84	21.23
Oct.	21.16	21.05	21.59	21.65	21.64	21.13
Dec	19.91	20.85	21.73	21.50	21.48	20.88
Jan.	19.85	20.78	21.06	21.41	21.42	20.76
Mar.	19.69	20.65	21.00	21.38	21.34	20.66

COTTON futures prices advanced sharply in early July after reports that OPA had raised ceilings on about one-third of the production of cotton textiles. A decline set in before the middle of the month, attributed to increasing expectation of a German military collapse and continued hot weather in the Cotton Belt which was checking boll weevil infestation. The $1\frac{5}{16}$-inch spot middling price recorded at 22.33¢ on July 1, rose to 22.81¢ on July 11, dropped to 22.27¢ on July 19, and closed at 21.89¢ August 1.

Direction 1 to Order M-12, effective August 1, requires producers of cotton linters to set aside 80% of their output that is acceptable for chemical use for delivery to the Commodity Credit Corp. Increased military demands for high-tenacity rayon tire cord and smokeless powder necessitated the order. Production of all grades of cotton linters for the cotton year August 1, 1943 - July 31, 1944, has been estimated at about 1,200,000 bales by the WPB.

The recently enacted Stabilization Act of 1944 increased the loan rate on cotton from 90 to 92.5% of parity. This diluted version of the much-debated Pace amendment requires ceilings on cotton textiles high enough for each major item to enable processors to pay parity to growers.

Cotton in cultivation on July 1 was estimated by the Department of Agriculture at 20,472,000 acres. Unofficial sources anticipate a crop of about 10,000,000 bales. Last year 11,428,151 bales were produced. A stock of about 10,000,000 bales from previous crops is on hand to supplement this year's crop. Consumption has been averaging around 11,000,000 bales a year.

Fabrics

The July gray cloths market was inactive while the trade waited for OPA textile pricing developments. Business was less than in several years. Some military sales were made, but almost no cloth was sold for civilian uses. Very little duck was offered, and this was all enameling, hose, belting, and ounce ducks in constructions, weights, and widths having a limited market. Rubber mills and sales yarn concerns received a directive early in the month to furnish 8% of production for cotton duck. The revision of Order M-317, issued July 6, the trade believes, may force cotton goods mills to run entirely on rated orders. Numerous changes in percentages which must be held for rated export orders and against all rated orders during the third quarter of 1944, were listed.

SCRAP RUBBER

THE demand for scrap rubber in July was less than in previous months, and there was said to be a paucity of orders from reclaimers to the trade. Scrap tires remain at ceiling prices, but boots and shoes and tire buffings have sold at less than ceilings. Collections were reported fair, but tires are not plentiful in the offerings. Meanwhile the government stockpile, upon which reclaiming plants are steadily drawing, is diminishing. An excess of tire parts is said to be overhanging the free market, and reclaimers may take advantage of a supply and demand situation if these are offered at below ceiling prices.

Scrap Rubber Ceilings

	¢ per Lb.
Inner Tubes†	
No. 2 passenger tubes	7¾
Red passenger tubes	7½
Passenger tubes	6
Tires‡	$ per Short Ton
Mixed passenger tires	20.00
Beadless passenger tires	26.00
Solid tires	36.00
Peelings†	
No. 1 peelings	47.50
No. 2 peelings	47.50
No. 1 light colored (zinc) carcass	52.50
Miscellaneous Items‡	
Air brake hose	25.00
Miscellaneous hose	17.00
Rubber boots and shoes	33.00
Black mechanical scrap above 1.15 sp. gr.	20.00
General household and industrial scrap	15.00

† All consuming centers except Los Angeles.
‡ Akron only.
‡ All consuming centers.

Fixed Government Prices*

Balata	Price per Pound: Civilian Use	Other Than Civilian Use
Manaos Block	$0.38¾	$0.38¾
Swinam Sheet	.42½	.42½
Guayule		
Guayule (*carload lots*)	.17½	.31
Latex		
Normal (*tank car lots*)	.26	.43½
Creamed (*tank car lots*)	.26¾	.44½
Centrifuged (*tank car lots*)	.27¾	.45½
Heat-Concentrated (*carload drums*)	.29½	.47
Plantation Grades		
No. 1X Ribbed Smoked Sheets	.22½	.40
1X Thin Pale Latex Crepe	.22½	.40
2 Thick Pale Latex Crepe	.22	.39½
1X Brown Crepe	.21¾	.38¾
2X Brown Crepe	.21½	.38½
2 Remilled Blankets (Amber)	.21¾	.38¾
3 Remilled Blankets (Amber)	.21½	.38½
Rolled Brown	.18	.35½
Synthetic Rubber		
GR-M (Neoprene GN)	.27½	.45
GR-S (Buna S)	.18½	.36
GR-I (Butyl)	.15½	.33
Wild Rubber		
Upriver Coarse (crude)	.12⅝	.26½
(washed and dried)	.20⅛	.37¾
Islands Fine (crude)	.14⅝	.28¼
(washed and dried)	.22½	.40
Caucho Ball (crude)	.11⅝	.24⅜
(washed and dried)	.19½	.37
Mangabiera (crude)	.08½	.19⅜
(washed and dried)	.18	.35½

*For a complete list of all grades of all rubbers, including crude, balata, guayule, synthetic, and latex, see Rubber Reserve Co. Circular 17, p. 169, May, 1943, issue.

RECLAIMED RUBBER

ANNUAL inventories and vacations in rubber plants have occasioned the usual summer lull in the reclaim market. An increase in activity is expected in September bulwarked by amendments, July 1, to Rubber Order R-1 permitting the use of reclaim in the manufacture of certain rubber articles in which its use had hitherto been prohibited. Greater activity is also anticipated in heels and soles. Tube reclaiming, which has been almost non-existent in past months, will proceed more normally now that inner tubes are no longer rationed. GR-S tubes offered by scrap dealers to reclaimers at 2½¢ a pound in comparison with 6¢ to 7¢ a pound for natural tubes have not found a ready market. One reclaimer, however, reports production of satisfactory GR-S reclaim on a small scale by methods which can be applied successfully to large-scale production. Natural rubber scrap contaminated with synthetic remains a problem which reclaimers feel must be eliminated at the source. The supply is good in staple lines. The worn tires on America's automobiles constitute a reserve which will become available as the tight situation in GR-S is relieved to permit the production of civilian synthetic tires.

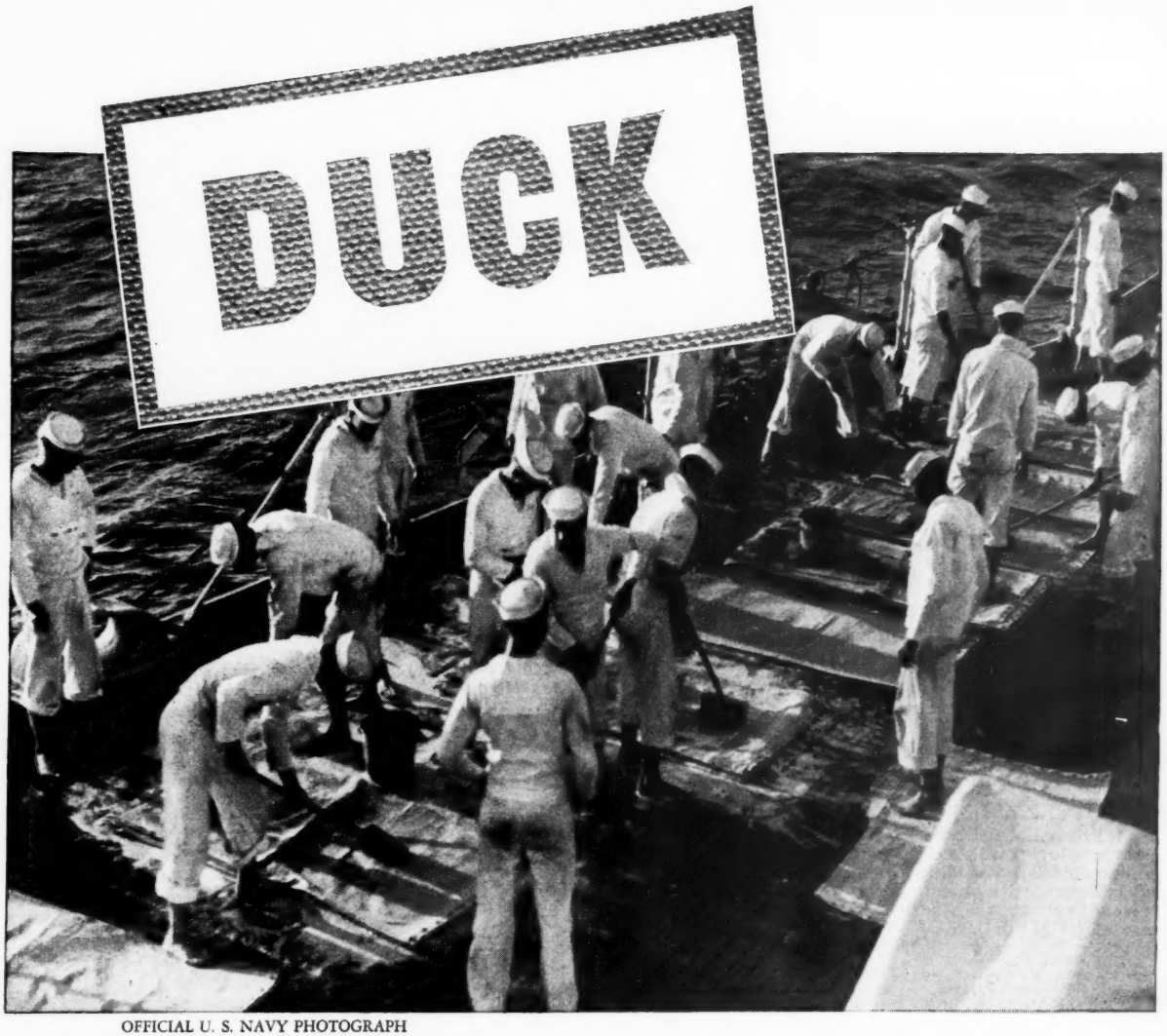
Reclaimed Rubber Prices

	Sp. Grav.	¢ per Lb
Auto Tire		
Black Select	1.16–1.18	6½/ 6¾
Acid	1.18–1.22	7½/ 7¾
Shoe		
Standard	1.56–1.60	7 / 7¼
Tubes		
Black	1.14–1.26	11¼/11½
Gray	1.15–1.26	12½/13¼
Red	1.15–1.32	12 /12¼
Miscellaneous		
Mechanical blends	1.25–1.50	4½/ 5½
White	1.35–1.50	13½/14½

The above list includes those items or classes only that determine the price bases of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity at special prices.

Compounding Ingredients Price Changes

Altax	lb.	$0.39	/ $0.41
Antisol	lb.	.225	/ .275
Calcene T	ton	37.50	/ 45.00
Captax	lb.	.34	/ .36
Cuprax	lb.	.60	/ .62
Cumate	lb.	2.00	
Ethyl Unads	lb.	1.53	
Fabrifil X-24-G	lb.	.095	
Fabrifil X-24-W	lb.	.135	
Filfloc 6000	lb.	.16	
Filfloc F-40-9000	lb.	.105	
Lode	lb.	.04	/ .045
Neoprene Latex dry weight			
Type 571	lb.	.36	/ .40
Concentrated	lb.	.41	/ .42
572	lb.	.45	/ .46
60	lb.	.43	/ .44
Neoprene Type CG	lb.	.50	
M	lb.	.65	
No. 16 Resin	lb.	.60	
P-33	lb.	.04	
Para Flux (reg.)	gal.	.10	/ .19
No. 2016	gal.	.135	/ .20
Para Lube	lb.	.0425	/ .048
Paraplex X-100	lb.	1.00	
Pentacizer 344	lb.	.20	
Pyrax A	ton	7.90	
Resinex	lb.	.0275	/ .03
Rotax	lb.	.44	/ .46
Spheron I	lb.	.0405	/
Spheron N	lb.	.15	
Stabilite	lb.	.48	/ .50
Syn-Tac	gal.	.275	/ .35
Tysonite	lb.	.165	/ .17
Thiokol Type ST	lb.	.66	/ .76
LP-2	lb.	.85	



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AT WAR ON SEA OR LAND

Duck is one of the most essential wartime fabrics and Army and Navy requirements have been tremendous since the rearmament program started. Today, American forces and their supply depots are in battle areas throughout the world and each force must have a steady flow of duck products for new equipment and for replacements.

Rugged enough to stand frequent drenchings, burning sun and even "laundering" with a big brush, Duck is a vital fabric in the Navy. Sailors' hammocks are only one of many shipboard items made of this sturdy, durable cloth. Because we are supplying so much of our Duck to the Army and Navy, eight of the eleven Army-Navy "E" awards made to the mills we represent were for excellence in the production of Duck.

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CHEMIST AND FACTORY SUPERINTENDENT experienced in compounding and manufacture of mechanical goods, natural and synthetic rubber. Chicago area. Excellent opportunity. Address Box No. 881, care of INDIA RUBBER WORLD.

TIME STUDY AND MOTION ANALYSIS MEN— must have several years' experience with progressive company. Furnish complete history in first letter. Location away from Ohio. Address Box No. 882, care of INDIA RUBBER WORLD.

TIRE AND TUBE DEVELOPMENT AND CONstruction engineers, excellent opportunity in a medium-sized organization. Salary commensurate with ability. Plant located in Pennsylvania. Address Box No. 883, care of INDIA RUBBER WORLD.

CHEMIST—WITH BACKGROUND ON TIRES, tubes, or mechanical goods. This opening has real possibilities both in regard to salary and continuity of employment. Address Box No. 884, care of INDIA RUBBER WORLD.

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FOUR OPENINGS IN A LARGE NEW ENGLAND RUBBER FOOTwear plant for Master Mechanic, Chemist, Pattern Man, Technical Superintendent. These positions will be permanent and profitable connections for the present and postwar. Address Box No. 890, care of INDIA RUBBER WORLD.

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BLOWN • SOLID • SPONGE
FROM NATURAL, RECLAIMED, AND SYNTHETIC RUBBER
THE BARR RUBBER PRODUCTS COMPANY SANDUSKY OHIO

SITUATIONS WANTED

COMPOUNDER-ENGINEER. EXPERIENCED IN COMPOUNDING and manufacture of mechanicals, tubes, pneumatic and solid tires, natural and synthetic rubber. Trained in production management by large company. Chemical Engineering Degree. California location desired because of children's health. Address Box No. 880, care of INDIA RUBBER WORLD.

CONSULTANT ON LAYOUT AND EQUIPPING plants, manufacturing and sales of mechanical hard and soft rubber, also plastics, by man with 25 years' actual experience. References given. Services confidential. Address Box No. 887, care of INDIA RUBBER WORLD.

PLANT ENGINEER—NEW ENGLAND—THOROUGHLY EXPERIenced in power—maintenance—molded and extruded goods requirements. Address Box No. 888, care of INDIA RUBBER WORLD.

RUBBER COMPOUNDER: 7 YEARS' EXPERIENCE WITH SYNthetics, including Plastics, desires position with progressive concern in Development of Industrial Rubber Goods. Age 30; married; Chemical Engineering Degree. Draft—2-B. Far West preferred. Address Box No. 892, care of INDIA RUBBER WORLD.

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SINCE 1900

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We are equipped to perform all types of physical and chemical tests for synthetic rubber.
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It is economic extravagance to be without these instruments. Used free handed in any position or on Bench Stands, convenient, instant registrations, fool proof.
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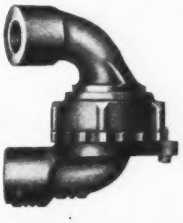
FLEXO SUPPLY COMPANY, 4218 Olive Street, St. Louis (8), Mo.



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(*Classified Advertisements Continued on Page 586*)

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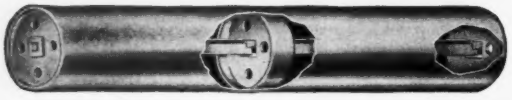

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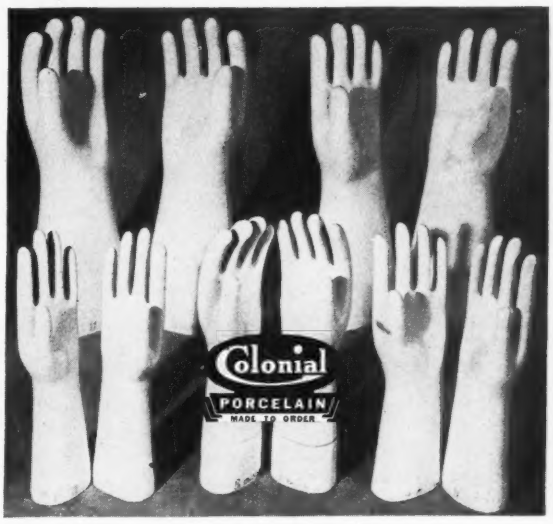

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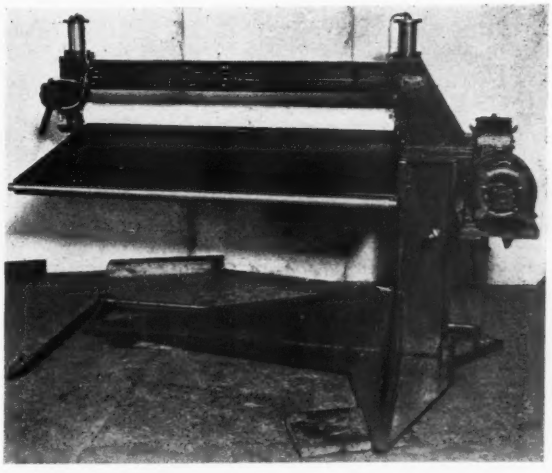

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